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REVIEW
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SHIBAMOTO (T.) & SHOJI (R.). **Studies on the so-called Boucherie process for wood poles preservation by pentachlorophenolates.**—*Bull. Tokyo Univ. For.* 44, pp. 187–199, 1953. [Abs. in *Rec. Res. Fac. Agric. Tokyo Univ.*, 3 (*1952–1953*), pp. 92–93, 1954.]

Sapwood of *Cryptomeria japonica* and *Chamaecyparis obtusa* was effectively treated with sodium and ammonium pentachlorophenolates by the Boucherie process [*R.A.M.*, 33, p. 191 and next abstract]. A concentration of 1·3 kg. per cu. m. was essential for complete protection, 0·4 kg. being ineffective.

PAPY (M.). **Le centenaire du procédé Boucherie.** [The centenary of the Boucherie process.]—*Rev. Bois*, 9, 9–10, pp. 3–5, 1 fig., 1954.

In connexion with the centenary of the Boucherie method of timber preservation [see preceding abstract] an interesting account is given of the development of the process and the life and background of the inventor (1801–1871).

BENOIT (J.) & JACQUIOT (C.). **Les principaux problèmes de la préservation des bois en France.** [The principal problems of wood preservation in France.]—*Rev. Bois*, 9, 9–10, pp. 23–25, 1954.

The problems of wood preservation in France [*R.A.M.*, 33, p. 328] are of two types, one involving the dissemination of propaganda among consumers concerning the need for and methods of treatment, and the other connected with the development of new procedures or the improvement of existing ones. Information is summarized on the occurrence and control of the rots of fallen wood, e.g., *Stereum purpureum* on beech and *S. sanguinolentum* on conifers, and of dry rot (*Merulius lacrymans*), which has become increasingly destructive in dwelling houses, especially in the north and west, since the second world war. Pentachlorophenol and BHC are used for the preservation of logs, and creosote (supplemented by a number of sanitary precautions) for that of constructional timber.

PEHRSON (S. O.) & PETTERSON (T.). **Preservation of ground-wood pulp against fungal attack. Combined treatment with phenyl mercury and pentachlorophenol.**—*Svensk PappTidn.*, 21, pp. 801–807, 1954. [German summary.]

Experiments have been in progress during the last few years at the Swedish Forest Products Research Laboratory, Stockholm, in the control of fungal damage to groundwood pulp during storage by treatment with phenyl mercurials [*R.A.M.*, 30, p. 427]. Some mercury-resistant species, e.g., *Penicillium roqueforti*, *Pullularia* [? *pullulans*], *Phoma* sp., and *Phialophora fastigiata*, survive this method of disinfection and cause more or less extensive discoloration. A combination of phenyl mercury and pentachlorophenol in the ratio of 1:40 produces a pulp with strong resistance to infection over a lengthy period. The cost of the treatment, however, is three to four times as high as that of the mercurials.

SUOLAHTI (O.). **Kuroinnan ja varastointiajen vaikutus pylväiden kyllästyvyyteen.** [Effect of decortication and duration of storage on the impregnability of poles.] —*Paperi ja Puu*, 35, 7, pp. 309–313, 1953.

A tabulated survey is given of experiments conducted at the Post and Telegraph Office, Haapajärvi, and the State Institute for Technical Research, Helsinki, Finland, to determine the influence of the method and date of decortication and the duration of the storage period on the impregnability of pine poles treated with a mixture of Boliden salt [*R.A.M.*, 32, p. 1] and zinc sulphate at a concentration of 3·5 per cent. by the normal pressure process [cf. 32, p. 653]. It was found that poles felled the previous year accepted the preservative more readily than those felled and treated in the same year. They should be clean-barked just before impregnation. [An abstract of this paper appears in *Timb. Technol.*, 62, 2180, p. 303,1954.]

NESEMANN (G.). **Über die antagonistische Beeinflussung von Wachstum und Atmung bei einigen höheren Pilzen.** [On the antagonistic influence on growth and respiration of some higher fungi.]—*Arch. Mikrobiol.*, 19, 3, pp. 319–352, 11 graphs, 1953.

At the Institute of Plant Physiology, University of Göttingen, Germany, *Merulius lacrymans*, *Polyporus sulphureus*, *Daedalea quercina*, *Pholiota mutabilis*, *Panus conchatus*, *Lepiota cepaestipes*, and *Xylaria polymorpha* were cultured on biomalt solution [cf. *R.A.M.*, 31, p. 583], and while the content of the antibiotic substance which they secreted into the culture solution was at its height (over a period ranging from 12 days to five weeks according to the species), their influence on the growth and respiration of *Coniophora cerebella* [*C. puteana*], *Polystictus versicolor*, *Fomes fomentarius*, *Trametes radiciperda* [*F. annosus*], and *Schizophyllum commune* was investigated.

In practically every combination growth was inhibited, especially in a radial direction, but in seven cases (representing about 20 per cent. of all the experiments) a low concentration of the antibiotic substance exerted a stimulatory effect. In cultures of *X. polymorpha* the growth-promoting factor could be separated from the inhibitory principle. In 28 per cent. of the tests respiration was inhibited as strongly as growth, but in most combinations it was less severely affected or even, e.g., in solutions of *D. quercina* and *P. versicolor*, increased as compared with the controls. Sulphanilamidothiazole also exercised a stronger adverse influence on the growth than on the respiration of *F. fomentarius*. The acids, especially oxalic, produced by the fungi participated in the antibiotic activity of the staled culture solutions. This could be reduced in certain solutions, e.g., those of *M. lacrymans* and *D. quercina* irreversibly and in *Panus conchatus* and *Pholiota mutabilis* reversibly, by neutralization; in *X. polymorpha*, *P. mutabilis*, and *Panus conchatus* by oxidation; and in *X. polymorpha* also by the addition of cysteine. It was further weakened by factors produced by the test fungi themselves.

Biotin was detected in the nutrient solutions of *X. polymorpha*, *P. conchatus*, and *Pholiota mutabilis*, but it was not identical with the growth-promoting factors. The impetus to the mycelial expansion observed in mixed cultures of *C. puteana* with *Penicillium* sp. on plum juice agar is attributed to the exclusion of inhibiting factors rather than to the operation of stimulatory principles.

VERRALL (A. F.). **Factors leading to possible decay in wood siding in the south.**—*Spec. Release Div. For. Path., U.S. Dep. Agric.* 39, 17 pp., 3 figs., 1953.

In addition to the recommendations for the prevention of decay in wood siding already noticed [*R.A.M.*, 32, p. 159] it is suggested that siding for buildings in the Gulf States should be immersed in a toxic moisture-repellent (Federal Specification TT–W–572) for at least three minutes.

Nordin (V. J.), Sutton (Willma), & Heming (J. W.). **Red stain and decay of Lodgepole Pine in Alberta.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 9, 3, p. 4, 1953.

In investigations of stain and decay in 133 living trees of lodgepole pine [*Pinus contorta* var. *latifolia*] in three localities in Alberta, *Fomes pini* accounted for only six per cent. of the basidiomycetes associated with red stain, an unidentified fungus referred to as 'unknown L' providing 85 per cent. of the isolations [cf. *R.A.M.*, 29, p. 485; 30, p. 205].

Eighty-five further isolations from red stain gave various hyphomycetes, including *Cytospora* and *Zythia* spp. Three cases of brown cubical decay and eight of white pitted decay were associated, respectively, with *Coniophora puteana* and *Polyporus* [*Polystictus*] *abietinus*.

Etheridge (D. E.). **Occurrence of a purple agar-staining fungus with decay in Alberta.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 10, 4, pp. 3–4, 1954.

A fungus determined as *Coryne sarcoides* [*R.A.M.*, 34, p. 195] in its imperfect state is becoming increasingly prevalent in association with various decays and stains in numerous native coniferous and deciduous hosts in Canada, where it has been reported from every major forest area. During decay investigations in Alberta 26 infections, or 9·7 per cent. of the total number identified with 'red stain' [see preceding abstract] in lodgepole pine [*Pinus contorta* var. *latifolia*], yielded this fungus. It was also identified in 17·5 per cent. of 240 infections in *Picea glauca*, *P. engelmanii*, and *P. mariana* [34, p. 195], from stands distributed in the Subalpine and Boreal Forest Regions, being present in 17·1 per cent. of the white basal rots, 23 per cent. of the brown, 8·2 per cent. of the white trunk rots, and 54·5 per cent. of the stains. The fact that the fungus occurred more frequently with brown basal rots than with white is of interest, as white basal rots predominated. There is some evidence of its presence in manufactured spruce products in Alberta.

The sole isolation of the fungus from samples of decayed wood has often prevented the determination of an associated wood-destroying fungus, especially where isolations were attempted from the margin of the advanced rot, as *C. sarcoides* shows some affinity for a pink stain bordering the typical decay. Its isolation from stains unassociated with rotting indicated that it may occur independently in the heartwood of living trees and may possibly be a precursor of decay pathogens.

Robak (H.). **Phomopsis pseudotsugae Wilson—Discula pinicola (Naumov) Petr. as saprophyte on coniferous woods.**—*Sydowia*, 6, 5–6, pp. 378–382, 1952.

Evidence is presented from the author's cultural studies in collaboration with T. Lagerberg and G. G. Hahn, that the fungus known as *Discula pinicola*, which has been isolated in Norway from spruce, *Pseudotsuga taxifolia*, and Siberian larch (*Larix sibirica*), is identical with *Phomopsis pseudotsugae* [*R.A.M.*, 26, p. 222; cf. 32, p. 157 and next abstract]. It is the agent of a dark olive-grey stain of the wood and may be grouped among the 'blueing' fungi. Fruiting occurs only rarely on pine and spruce in nature. Ordinarily saprophytic, the species appears to comprise some more virulent strains, such as the one causing die-back of larch.

Plasman (A.). **Note sur la découverte en Belgique de Phomopsis pseudotsugae Wilson sur Pseudotsuga taxifolia (Lam) Britt.** [A note on the discovery in Belgium of *Phomopsis pseudotsugae* Wilson on *Pseudotsuga taxifolia* (Lam.) Britt.]—*Parasitica*, 9, 1, pp. 1–5, 1953.

Phomopsis pseudotsugae [see preceding abstract], not previously recorded in Belgium [*R.A.M.*, 26, p. 367], was identified on eight-year-old Douglas fir (*Pseudo-*

tsuga taxifolia) branches from Neufchâteau. The pycnidia averaged 300 μ in diameter, and the hyaline, 1-celled, fusiform or ellipsoid pycnidiospores measured 6·5 to 8 by 3 to 4 μ. No spread has occurred in the vicinity since 1949.

WALLIS (G. W.). **Commercial thinning in Douglas Fir in relation to control of Poria weirii root rot.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 10, 3, p. 4, 1954.

To ascertain the effect of thinning on losses from root rot (*Poria weirii*) [*R.A.M.*, 33, p. 693] in Douglas fir [*Pseudotsuga taxifolia*] annual examinations are being made in plots on a 50-acre block of 50-year-old trees at Cowichan Lake Forest Experiment Station, Vancouver Island, from part of which 41 per cent. of the total volume or 44 per cent. of the total number of trees were removed in 1951 in a commercial thinning. The stand as a whole was heavily infected at the time of thinning, but all the plots were selected from areas where there appeared to be no injury from root rot or symptoms of current infection.

Heavy losses from windthrow occurred one year after thinning. Most of the fallen trees had been severely infected at the time of thinning, and a large part of the supporting roots of such trees was completely decayed; such trees had, therefore, been unable to withstand the removal of adjacent and sheltering trees. Losses during the second and third years after thinning were progressively less.

WALKER (R. E.). **Oil impregnation of Douglas Fir using a pressure reduction and an oil-water treatment.**—*Iowa St. Coll. J. Sci.*, 27, 2, pp. 273–274, 1953.

Two methods of injecting a 5 per cent. pentachlorophenol solution [*R.A.M.*, 32, p. 654] into Douglas fir [*Pseudotsuga taxifolia*] poles to improve penetration and produce an oil-free surface were developed in the laboratory and checked on a commercial scale. In both methods the pressure was increased to 150 lb. per sq. in. to force the oil into the wood. In the 'oil-water' treatment, water was injected after the oil period, the poles were steamed, and a vacuum was applied to vaporize the injected water. The 'pressure-reduction' treatment involved slowly reducing a high initial oil pressure to atmospheric pressure followed by a steaming and vacuum cycle. The pressure-reduction charge received a retention of less than 5 lb. oil per cu. ft. of pole; the other charges an average retention of 6 to 7 lb. The oil-water treatment appeared to be preferable to the pressure-reduction, but the data from the latter on a commercial scale were insufficient for a valid comparison to be made.

BAGCHEE (K.). **Merulius lacrymans (Wulf.) Fr. in India.**—*Sydowia*, 8, 1–6, pp. 80–85, 3 pl. (1 col.), 1954.

First observed in India in 1929 on a ceiling made of spruce boards in a Punjab forest rest house at an altitude of 7,000 to 8,000 ft., and collected at the same time on spruce and *Abies pindrow* logs in the vicinity, *Merulius lacrymans* has since been found on various occasions on conifer wood both indoors and in the forest. In 1952 the fungus was again detected in the original area and at an elevation of 10,000 to 10,500 ft. on decaying logs of *A. pindrow* in association with *Poria carbonica*, *Fomes roseus*, and *Lenzites subferruginea*. Some important contributions to the literature on the controversial problems of the biology and identity of the fungus are summarized [*R.A.M.*, 7, p. 292 *et passim*].

PURUSHOTHAM (A.) & TEWARI (M. C.). **A preliminary note on the preparation, by a simple process, of copper and zinc preservatives from Chir resin.**—*Indian For.*, 80, 9, pp. 560–568, 1954.

In 1942 a wood preservative, vecu, was prepared at the Forest Research Institute, Dehra Dun, India, from mohwa oil by subjecting it to thermal cracking and by

direct reaction of the liberated free acids from the glycerides (mainly stearic acid) with copper and zinc metals in the form of fine powder or turnings. Diluted with fuel oil it was used to impregnate timbers of low natural durability. According to recent graveyard inspections a 70 per cent. dilution gave fairly satisfactory preservation, though 50 per cent. is suggested as being more suitable for use in the open or in contact with the ground.

Recent experiments indicate that crude benzene is more suitable as a solvent for the resin than kerosene. Preservatives containing, respectively, 2·8 per cent. copper and 6 per cent. zinc were prepared from chir (*Pinus longifolia*) resin. Graveyard tests started in 1930 using copper resinate (2 per cent., in earth oil), prepared with sodium and potassium hydroxides, showed that the average life for *P. longifolia*, *Bombax malabaricum*, and *Shorea robusta* after treatment was 10, 16, and 10 years, respectively. The average life of *S. robusta* treated in 1943 with vecu (in earth oil in a ratio of 80:70) was over seven years and at 20:80 over six years, compared with one year for the untreated and for *Dendrocalamus strictus* (10:90) five years.

Cuprinol (green) has given (up to 1954) an average life of nine years for *P. longifolia*, *Picea morinda*, and *Anogeissus latifolia*, seven for *Abies pindrow*, 17 for *Schleichera trijuga* and *B. malabaricum*, eight for *Terminalium tomentosa*, and six for *Lannea grandis*, while cuprinol (super) gave nine years for *Pinus longifolia*, five for *A. pindrow*, seven for *S. trijuga* and *Anogeissus latifolia*, and six for *B. malabaricum*. All the cuprinol material was immersed for 24 hours.

Laboratory and field exposure tests indicate that a retention of 8 lb. per cu. ft. of copper naphthenate solution in petroleum oil containing 0·5 per cent. copper metal or 0·5 lb. zinc chloride per cu. ft. gives adequate protection to timber under fairly severe exposure conditions. The copper and zinc resin preservatives (copper and zinc abietates) may be diluted six times and twice, respectively. An advantage of the resin preservative is that it can be used as a varnish also.

Prices in comparison with copper naphthenate at Rs. –/12/5 per lb. and copper and zinc naphthenate (hardi-proof) at Rs. 1/2/7 are for copper abietate Rs. –/8/6, and for zinc abietate Rs. –/9/6.

Timber Research Laboratory. Annual Reports for the years 1946, 1947 and 1948. —Transvaal Chamber of Mines, 152 pp., 1 diag., 16 graphs, [undated].

In a service experiment begun early in 1945 in the Robinson Deep Mine, Transvaal, six preservative mixtures were used on saplings and head boards of *Eucalyptus saligna*, wattle (*Acacia mollissima*), and pine. In 1948 it was evident that mixtures containing copper sulphate had conferred the best protection, the timber being still in good condition. These results were supported by accelerated laboratory tests on *E. saligna* blocks infected with three test fungi (*Polyporus rugulosus*, *Hydnum henningsii*, and unidentified 1999) found in the mines. In 1947 it was found that copper sulphate alone or with bichromate did not confer full protection against *H. henningsii*, whereas a mixture of 3 per cent. zinc sulphate and 0·6 per cent. sodium silico-fluoride was toxic to all three test fungi (unidentified 1993 being substituted for 1999).

Pitch pine [*Pinus palustris*], formerly a stable mine timber, now deteriorates rapidly if untreated. In laboratory tests over six months with four fungi isolated from various sites, *Polyporus rugulosus* proved to be the most damaging to *E. saligna* test pieces, *Lentinus lepideus* causing only about half as much loss in weight, and *Coprinus* sp. a quarter. Impregnation with a solution containing 3·9 per cent. copper sulphate and 3 per cent. sodium bichromate (both anhydrous) for two hours at 70 lb. pressure is suggested, timber with a high proportion of sapwood to be used.

In laboratory tests of natural durability of timber it was found that a soil method was a much more drastic test than a malt agar method.

Compounds which killed *Sporotrichum beurmani* [*S. schencki*: *R.A.M.*, 1, p. 352; 7, p. 240] on timber in the mines were: 5 or 6 per cent. chlorinated phenols or phenates, fortified 'Yard mixture' containing 4 per cent. zinc sulphate and 0·4 per cent. triolith Z, and copper sulphate stronger than 0·65 per cent. with or without sodium bichromate.

Service tests on fabrics in the mines, started in 1946, showed that copper carbonate was useful only for treating hessian which was then remarkably resistant. For flannel and cotton duck cuprinol and permatox A special gave the best results. Coco-nut matting was severely attacked in three months by *Polyporus rugulosus* and *Coniophora* sp. 2002 in laboratory tests. Cuprinol, permatox A special, and copper carbonate conferred complete protection for one year. Blankets used in mines were completely protected against fungal deterioration by 2·5 per cent. copper carbonate applied after every wash or every six months. In soil burial tests vinylized fibre glass fabric 5027 appeared to be immune from microbial attack over three months.

COLHOUN (J.). **Biological techniques for the evaluation of fungicides. III. The evolution of a technique for the evaluation of soil fungicides for the control of club-root disease of Brassicae.**—*Ann. appl. Biol.*, 41, 2, pp. 290–304, 1954.

In continuation of this series of papers [*R.A.M.*, 21, p. 489] further studies at Queen's University, Belfast, on *Plasmodiophora brassicae* [33, p. 573] are described. A large number of fungicides was investigated for the control of the disease by means of a special technique. Four soils, three of approximately pH 6·2 and one of pH 4·8, were used; two of the former had borne severely affected crops for some years, the latter being free from the disease. The seedlings (Enfield Market cabbage) were grown in water-tight tins [31, p. 216].

The results obtained demonstrated that the effectiveness of the fungicides (incorporated as powders into the air-dry soil) against *P. brassicae* was influenced by the spore load present in the soil, the duration of storage of spores prior to inoculation, the time of year, and temperature. Many fungicides were less effective in soil heavily treated with slaked lime than in unlimed soil or in soil treated with calcium carbonate. In general, fungicides were less effective when infection was heavy. If experiments are conducted under comparable conditions, consistent results can be obtained.

It is recommended that for fungicide tests against *P. brassicae* there should be a preliminary pot test with a spore load of 10^5; materials found satisfactory should be given a more detailed test. Each fungicide should be tested at pH 5 to 6·3 as well as in soil treated with slaked lime to adjust the reaction to pH 7 to 7·2. In both the preliminary and the detailed tests the soil used should be free from initial contamination by *P. brassicae*. Fungicides in powder form should be applied to air-dried soil treated with slaked lime if necessary. Those in solution should be added after the spore suspension has been incorporated with the soil. The spores used should not have been stored longer than two months. The tests should be conducted with the soil moisture content maintained at 70 per cent. of the maximum water-holding capacity and a mean air temperature of 23°C., though with acid soils tests may also be made at 18°. Conditions which allow good plant growth are necessary, and the plants should be allowed to continue growth until well-developed clubs have formed on the roots in untreated soils. Mercuric chloride, 200 ml. of 0·1 per cent. solution per 3,000 gm. oven-dried soil, is suggested as a standard treatment for comparative purposes. Results can be obtained inside four or five weeks.

ROLAND (G.). **Résultats d'une enquête sur la jaunisse du Navet (Brassica virus 5).** [Results of an investigation of Turnip yellows (*Brassica* virus 5).]—*Parasitica*, 9, 2, pp. 54–58, 1 map, 1953. [Flemish summary.]

A survey of 34 fields in East and West Flanders and the province of Antwerp

made in November and December, 1952, showed that turnip yellows virus (*Brassica* virus 5) [*R.A.M.*, 32, p. 294] was present in all parts of these regions and that in every locality visited crops planted early were more severely affected than those planted late, aphid vectors [*Myzus persicae*] being less prevalent towards the end of the summer. Growers are advised to defer planting turnips until the second half of August.

BERKELEY (G. H.) & TREMAINE (J. H.). **Swedes naturally infected with two viruses.** —*Phytopathology*, 44, 11, pp. 632–634, 1954.

The results of studies at the Laboratory of Plant Pathology, St. Catharines, Ontario, showed that strains of turnip virus 1 [turnip mosaic virus] and cucumber mosaic virus were involved in the etiology of a mosaic disease of Laurentian swedes in Quebec and strains of turnip mosaic virus and cauliflower virus 1 [cauliflower mosaic virus] in a mosaic of the Ditmar variety in Nova Scotia. The symptoms induced by these strains on certain hosts differed from those associated with swede mosaic (turnip mosaic virus) in Ontario [*R.A.M.*, 33, p. 331].

The thermal inactivation points of the three turnip mosaic viruses were practically identical, namely, 59° to 61° C. for the Ontario strain and 59° to 60° for the Nova Scotia and Quebec isolates. Ageing required 54, 36 to 48, and 30 to 36 hours, respectively, for the Nova Scotia, Ontario, and Quebec strains. Only 10 of the 21 hosts inoculated were susceptible to cauliflower mosaic virus, viz., swede, rape, cabbage, stock [*Matthiola incana*], wallflower, Chinese cabbage, Swiss chard, radish, Brussels sprouts, and cauliflower. It was inactivated by a temperature of 78° and by more than six days' ageing.

The Quebec strain of cucumber mosaic virus attacked swede, rape, stock, wallflower, zinnia, *N*[*icotiana*] *glutinosa*, tobacco, petunia, spinach, globe amaranth [*Gomphrena globosa*], sugar beet, Swiss chard, dame's violet [*Hesperis matronalis*], and radish, the two last-named being symptomless carriers. Differences were noted between the Quebec and dame's violet strains of the virus.

Amoeboid inclusion bodies occurred in epidermal peelings of *N. glutinosa* and turnip infected by either the Quebec or Nova Scotia strain of turnip mosaic virus [31, p. 363], as well as in radish or turnip leaves inoculated with the Nova Scotia strain of cauliflower mosaic virus. They were absent, however, from *N. glutinosa* and tobacco inoculated with the Quebec strain of cucumber mosaic virus.

On the basis of host range, ageing, and thermal inactivation points the Nova Scotia and Quebec viruses are considered to fall naturally into the turnip mosaic group. The results of these experiments demonstrate for the first time that swedes may be naturally infected by combinations of strains of either turnip and cauliflower mosaic [cf. 24, p. 438] or turnip and cucumber mosaic viruses.

CORNFORD (C. E.). **Effect of downy mildew on yield of Sugar Beet.**—*Plant Path.*, 3, 3, pp. 82–83, 1954.

In an experiment carried out in 1947 at Dunholme Field Station, near Lincoln, healthy Kuhn E sugar beets were artificially infected with *Peronospora schachtii* [cf. *R.A.M.*, 33, pp. 273, 587] by placing a few drops of a conidial suspension on the central leaves on 3rd and 30th June and 24th July. The maximum percentages of plants that developed infection for the three dates were, respectively, 80, 29, and 11, as against 15 for the [unspecified] controls; the corresponding figures for yields in tons per acre of washed beets on 17th October were 7·58, 9·35, 9·76, and 10·03, and of sugar 29·84, 37·25, 39·67, and 39·01.

In 1948, Battle's E plants were similarly inoculated on 9th June, 12th July, 10th August, and 14th September. Not all the inoculations were successful, but comparisons between the weights of individual beets showed that infection

decreased the yield of washed roots by 30·8 per cent. and reduced the sugar percentage from 16·67 to 15·61 per cent.

In 1949, Dobrovice plants were inoculated on 21st June, and those which were first seen to be infected (on 18th July) sustained 37 per cent. loss in root weight at harvest in November.

Canova (A.) & Baldoni (R.). **Prove di disinfezione dei glomeruli di Barbabietola.** [Tests of disinfection of Beet glomerules.]—*Ann. Sper. agr.*, N.S., 7, 2, pp. 385–393, 1953. [English summary.]

When fruit clusters of the sugar beet varieties Alba 922, Klein N, and Dieckmann E showing, respectively, slight, moderate, and severe infection by *Phoma betae* [*R.A.M.*, 32, p. 4] were treated at the Experimental Laboratory of Plant Pathology and the Seed Analysis Laboratory, Bologna, Italy, with mercurigamma (organic compounds of mercury plus the gamma isomer), agrosan GN, sesan [29, p. 358], spergon, rumianca dust [29, p. 17], and fernasan (thiram) [31, p. 578], sown immediately, and on germinating removed for examination, the average percentage infection for the three varieties together was, respectively, 4·3, 6·7, 19, 27·7, 21, and 1, as compared with 35·7 for the untreated. When the seed clusters were sown 20 days after treatment the corresponding figures (treated lots only) were 0, 0, 3·3, 9, 6·7, and 0. The treatments had no adverse effect on germination.

Nikolić (V.) & Matić (I.). **Uticaj žutice na prinos Šećerne Repe.** [The effect of yellows on the yield of Sugar Beet.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1954*, 23, pp. 72–79, 1954. [English summary.]

Analyses carried out at the Institute for Sugar Beet Selection, Crvenka, Yugoslavia, in August, September, and November, 1953, showed that sugar beet yellows virus [*R.A.M.*, 32, p. 528] reduces root yields [33, p. 399] during the whole of the growth period, the difference between healthy and infected plants being greatest during the dry period. Sugar, dry matter, and harmful nitrogen contents are higher in infected plants at first, but by the end of the season the differences disappear completely. Leaf losses from infected plants are extremely high, leaf yields being only about 39 per cent. of the healthy. Sugar losses were computed at 34·4 per cent. in the August analysis and 19·2 per cent. at the September. Assuming that the reduction is only 20 per cent. and that 60 per cent. of the 80,000 ha. planted in Yugoslavia become infected, the average yield per ha. being 160 q[uintals; 1 quintal = 100 kg.], the total loss of sugar would then amount to 20,000 metric tons per year. In view of the increased severity of the disease in 1952 and 1953, the losses, however, may be underestimated.

Hare (W. W.). **A Cercospora on winter Pea.**—*Plant Dis. Reptr*, 38, 11, pp. 781–782, 1 fig., 1954. [Multilithed.]

The occurrence in 1954 on Austrian Winter type peas of a species of *Cercospora*, closely agreeing in its symptomatology with *C. lathyrina* [*R.A.M.*, 21, p. 180], is reported from a field at the Coastal Plain Branch Experiment Station near Newton, Mississippi. The disease first affected plants in low-lying, waterlogged areas, later spreading over the whole field. Leaf lesions containing similar *Cercospora* spores were found on vetch (*Vicia villosa*) growing in and around the field.

Sörgel (G.). **Über den Entwicklungsgang von Mycosphaerella pinodes (Berk. et Blox.) Stone. I. Die Bildung der Fortpflanzungsorgane in 'normalen' Kulturen.** [On the development of *Mycosphaerella pinodes* (Berk. & Blox.) Stone. I. The formation of the reproductive organs in 'normal' cultures.]—*Arch. Mikrobiol.*, 19, 3, pp. 247–261, 3 figs., 9 graphs, 1953. [Received February, 1955.]

In studies at the Institute for Plant Breeding, Quedlinburg, Germany, the

formation of the reproductive organs of *Mycosphaerella pinodes* in cultures on a 1 per cent. seed coat decoction from the highly susceptible Wonder of Kelvedon pea variety kept in darkness at 24° C. fell into three phases, pycnidial, pseudothecial, and chlamydospore [*R.A.M.*, 34, p. 338]. About 88 per cent. of the pycnidia of a given culture attained maturity, which was preceded by the production, reaching a maximum between 96 and 120 hours, of clear, later pink drops containing conidia. The succeeding pseudothecial phase culminated between 210 and 216 hours, but it had already begun between 48 and 54 hours of the pycnidial phase, and in fact, some 13 per cent. of all the organs formed during the whole of the latter were pseudothecia. Chlamydospore formation was initiated towards the end of the pseudothecial phase and increased more or less steadily (apart from a temporary peak at about 225 hours) until after 280, when a sudden rise began and continued until the numbers reached 1,969 per six hours, this being the highest total for any of the reproductive organs.

Starr (G. H.), Walters (H. J.), & Bridgmon (G. H.). **White mold (Sclerotinia) of Beans.**—*Bull. Wyo. agric. Exp. Sta.* 322, 11 pp., 6 figs., 1953.

White mould (*Sclerotinia sclerotiorum*) of snap bean [*Phaseolus vulgaris*: *R.A.M.*, 33, p. 401] is becoming more widespread in Wyoming, particularly in the northern part of the State. Calcium cyanamide (1,000 lb. per acre) gave some control of the disease but is not economical. Infected bean straw should not be used in fields where beans, peas, potatoes, tomatoes, lettuce, radishes, and other susceptible crops are to be grown. Similarly, infected soil should not be planted to these crops for at least three to five years.

Waterhouse (W. L.). **Australian rust studies. XIII. Specialization of Uromyces phaseoli (Pers.) Wint. in Australia.**—*Proc. Linn. Soc. N.S.W.*, 78, 5–6, pp. 226–232, 1 pl., 1953. [Received March, 1955.]

In 1948 a new race of *Uromyces phaseoli* [*U. appendiculatus*], No. 17 A, was distinguished on beans [*Phaseolus vulgaris*] in Australia [*R.A.M.*, 29, p. 497; 34, p. 136], in addition to races 2 and 17. This race attacks the widely grown dwarf varieties (all are listed) which were resistant to the old races. Cherokee Wax, Cooper Wax, Feijao, Florida Belle, Harter's 765, 780, and 814, Kentucky Wonder Brown Seeded, Westralia [31, p. 467], Lazy Wife, Little Navy, Native Bean, Pacer, Purple Pod, Rainy River, Resistant W. A. Kentucky Wonder, Small White, Stringless (Agrow's), and Weston are resistant to all three Australian races of *U. appendiculatus*. The author emphasizes the importance of the strictest control of the parentage of the varieties maintained as differentials.

Gerdemann (J. W.). **The association of Diaporthe phaseolorum var. sojae with root and basal stem rot of Soybean.**—*Plant Dis. Reptr*, 38, 11, pp. 742-743, 1954. [Multilithed.]

Diaporthe phaseolorum var. *sojae* [*R.A.M.*, 34, p. 126] was associated with root and basal stem rot of soy-bean in four fields in Illinois in 1953, this being, apparently, the first record of such association. In pot experiments with seeds sown in steam sterilized, infested soil brown lesions developed on the cotyledons, lower hypocotyls, and upper tap roots near the soil line, killing some of the seedlings and stunting the others.

In the spring of 1954 abundant pycnidia were found on old, partially decomposed soy-bean stems obtained from above and below ground in a field in which the crop was last grown in 1951. The fungus may survive in this way for long periods, then, possibly, infect the base of the plant, remaining semi-dormant during the growing season and spreading through the plant as it matures.

Behr (L.). **Die Gelbfleckigkeit des Spinates (Spinacia oleracea L.). Untersuchungen über einen mitteldeutschen Virusstamm.** [Yellow spotting of Spinach (*Spinacia oleracea* L). Studies on a central German virus strain.]—*Arch. ges. Virusforsch.*, 6, 1, pp. 1–28, 10 figs., 1955.

In the early spring of 1951 spinach crops on three farms belonging to the Martin Luther University, Halle, were heavily damaged by a hitherto unknown strain of cucumber mosaic virus causing symptoms closely resembling those of 'spinach blight' in the United States [*R.A.M.*, 32, p. 167], which has also been reported previously from Germany [16, p. 680], Holland [19, p. 186], and Sweden [31, p. 417]. The first signs of infection in the field appeared on the young inner leaves in the form of narrowing and blistering of the leaf surfaces, abnormally pale coloration, and a distinct yellow-green mottling. The foliar distortions became progressively more severe, and the mosaic pattern more pronounced. Within a few days the virus spread to the older leaves, on which coalescent, lemon-yellow spots developed; the plants ceased to grow and soon died. Matador and Juliana spinach plants inoculated mechanically with the virus (herein designated 'SV') developed symptoms similar to those described. The average incubation period of the virosis in the greenhouse is eight days; it is shorter in warm and longer in cold weather. The thermal death point of the virus is 65° C. It survives 12 days *in vitro*, withstands 21 days' ageing at 1°, and remains infectious in dead leaves for 12 days; its dilution end point is 1 in 35,000. It is transmissible by rubbing with infective sap and through the agency of aphids, e.g., *Myzodes* [*Myzus*] *persicae*, but not by grafting; transmission through the seed was not demonstrated.

Cucumber plants inoculated with the spinach virus react by partial necroses of the leaf veins and convexity of the interveinal areas of the leaf surface; in other portions of the shoot the virus is present in a masked form. The host range of the virus is extensive, among the plants responding to inoculation by definite symptoms being Samsun tobacco, sugar beet, *Zinnia elegans*, and tomato. *Nicandra physaloides* reacts to infection by the production of abnormally narrow petals and serves as a differential host.

The strain of cucumber mosaic virus with which SV presents the closest analogies is that investigated by Tjallingii in Holland [32, p. 231], but the two are not identical, and it is concluded that the German isolate is a new one.

Lutes (D. D.). **Inheritance of resistance to systemic Tobacco mosaic infection in Pepper.**—*Diss. Abstr.*, 14, 11, pp. 1900–1901, 1954.

In studies at the University of Missouri the reaction types of tobacco mosaic virus on a series of varieties and experimental lines of chilli pepper (*Capsicum frutescens*) [*R.A.M.*, 14, p. 126; 32, p. 8; 33, p. 402] were determined as follows: (1) local infection resulting in small chlorotic lesions near the infection site, followed by necrosis and falling of infected leaves without systemic spread; (2) systemic infection of leaves and fruit with chlorotic lesions followed by mottling; (3) systemic infection of the chlorosis type accompanied by small necrotic lesions on the main stem; and (4) systemic infection with large, dark, necrotic lesions on the main stem. Normal growth and fruit yield are reduced in cases of systemic infection.

In separate crossing and selfing tests to determine the genetic constitution of a single uninfected California Wonder plant found in a heavily infected field in south-western Missouri, the F_1 progeny gave the phenotypic infection ratio of three plants with localized necrosis to one with systemic necrosis, the genetic constitution of these plants being respectively, LL, Ll^i, Ll, and l^il.

As resistance is determined by the ability of the plant to localize the virus completely, a breeding programme has been initiated in Missouri for developing resist-

ance [33, p. 469] from descendants of this hybrid. Of 100 hybrid and back-cross lines carried through the F_6 generation in field tests only two selections were considered promising as commercial lines. Their progeny were completely resistant to systemic infection and superior to California Wonder [loc. cit.] in rate and percentage seed germination, initial growth rate, and earliness of flowering and fruiting, equal to it in fruit quality, but slightly inferior in quantity.

Dempsey (A. H.) & Brantley (B. B.). **Pimiento production in Georgia.** —*Bull. Ga Exp. Sta.* **277**, 27 pp., 2 figs., 1953.

This revision of Bulletin 259, briefly describing the methods of cultivation of pimento [chilli] in Georgia [cf. *R.A.M.*, 21, p. 161], includes a section in popular terms on diseases and their control (pp. 21–25).

Yokohama (M.). **Effects of the new fungicides on the anthracnose and downy mildew of Cucumber.**—*Agric. & Hort., Tokyo*, 30, pp. 193–196, 1955. [Japanese.]

Spraying with two commercial cupromercurial fungicides has given reasonably good control of cucumber anthracnose [*Colletotrichum lagenarium*] and downy mildew [*Pseudoperonospora cubensis*] in Japan [C.M.I. map No. 285]. Spraying with organic mercurials is less toxic to the fungi and also injures the plants, while dusting with these compounds, effective against anthracnose, is apt to be phytotoxic. The zinebs are very active in the control of *C. lagenarium*, and their fungicidal effects may be enhanced by spraying on the reverse side of the leaves.

Crowley (N. C.). **Some variables affecting the use of Cowpea as an assay host for Cucumber mosaic virus.**—*Aust. J. biol. Sci.*, 7, 2, pp. 141–150, 2 graphs, 1954.

In a study of the factors affecting the production of local lesions by cucumber mosaic virus on cowpea [*R.A.M.*, 32, p. 164] conducted at the Waite Agricultural Research Institute, Adelaide, Australia, repeated experiments showed that quantitative work may be carried out with the virus at dilutions of 1 in 20 to 1 in 200; 1 in 50 produces lesions in numbers large enough for accurate counting, but it is better to use several dilutions. In two experiments with the half-leaf method [loc. cit.] there was a slight run-over of inoculum from one half-leaf to the other, but not great enough to make a significant difference in the results of any treatment. The method is the most satisfactory for use in quantitative work except where it is imperative that no run-over should occur. Carborundum and alauxite (both 500-mesh) were the most effective inoculation aids, giving up to ten times the number of lesions in the controls (no abrasive); both were greatly superior to celite.

Washing off the inoculum shortly after inoculation was not of critical importance in local lesion production; it adds another variable to every experiment and increases the risk of run-over.

The pH range of the virus varied markedly with duration of exposure to that pH. Inoculum less than an hour old was infective at all values from 3 to 10, while at eight hours it was infective only over the range pH 6 to 8. Quantitative work should, therefore, be carried out with inoculum buffered to pH 7 to 8, within which range infectivity is most stable.

More lesions developed on cowpea plants placed under fluorescent lights at 200 foot-candles than on plants kept in the glasshouse or under higher light intensities, 800 foot-candles apparently inhibiting virus multiplication.

Rapid drying (in a stream of warm air) of inoculated leaves consistently raised lesion counts but did not greatly increase the sensitivity of the reaction and, as a further factor which might increase the variation between plants, is undesirable.

The detached leaf culture technique [25, p. 269] gave more lesions than there were on attached leaves but did not reduce variation in numbers; further, the lesions on the detached leaves spread more readily, and this made accurate counting difficult.

Ljubinković (B.). **Predvidjanje rokova prskanja vinograda protiv plamenjače.** [Forecasting dates for spraying vineyards against downy mildew.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1953*, 15, pp. 78–87, 2 graphs, 1953. [French summary.]

Experiments carried out in 1952 in Yugoslavia to determine the possibility of establishing a central forecasting service for the whole country to issue spray warnings for the control of vine downy mildew (*Plasmopara viticola*) [C.M.I. map No. 221; *R.A.M.*, 30, p. 12], although unsatisfactory because of the negligible development of the fungus, have shown that there are promising possibilities for such an organization. Repeat experiments are planned.

Delp (C. J.). **Effect of temperature and humidity on the Grape powdery mildew fungus.**—*Phytopathology*, 44, 11, pp. 615–626, 2 figs., 2 graphs, 1954.

At the Department of Plant Pathology, University of California, Davis, a modification of Wenzl's celloidin membrane method [*R.A.M.*, 19, p. 33] was used to study germination, infection, and growth of vine mildew (*Uncinula necator*) [30, p. 402, 33, p. 748], which is difficult to control in the State in dry seasons. The minimum temperature for germination was found to be below 6° C.; for infection of the highly susceptible Emperor and Carignane varieties and for growth it was about 7°. Rapid germination, infection, and growth occurred between 21° and 30°, with an optimum for germination at 25°. No infection took place at a leaf temperature above 31·5° and germination ceased at about 33·5°. At approximately 31° less than 10 per cent. of the conidia produced were viable. Ten hours' exposure above 34° or four hours at 40° killed the conidia in mildew colonies and on glass slides. Actively growing colonies were killed on leaves heated to 34° for 2½ days, 36° for 10 hours, or 39° for six hours.

Vapour pressure deficit (*Phytopathology*, 6, pp. 428–432, 1916; *Ecology*, 17, pp. 277–282, 1936) was shown to be the best indication of moisture stress, but neither this criterion nor relative humidity should be used independently of temperature in evaluating the influence of humidity on *U. necator*. Conidial germination on dry slides was not affected by low humidity at temperatures up to 25°, but at 28° a slight reduction was observed above 21 mm. vapour pressure deficit. The conidia germinated in dry air at 33° and 38 mm. vapour pressure deficit; but germination was reduced at all temperatures when the conidia were exposed to a humid atmosphere of 6 mm. vapour pressure deficit and water condensed on the slide. On vine leaves conidial germination, infection, and growth took place normally under all atmospheric moisture stresses from 25° to 31°.

The foregoing tests were made in a regulated air stream of constant humidity and temperature passed over attached leaves in a specially constructed apparatus consisting of two tunnels. The first accepted a given atmosphere, allowed the air to homogenize, and directed a streamlined air current into the second tunnel, a trap door in the bottom of which permitted the insertion of the leaf. The top was covered by a glass plate and illuminated by 200 foot-candles from blue fluorescent lights. The controlled atmosphere passed over the leaves at the rate of about one mile an hour.

Other environmental factors being comparable, conidial germination was not perceptibly influenced by the host. However, infection, growth, and sporulation were inversely proportional to the maturity of the leaves, and berries of the Muscat of Alexandria, Tokay, Carignane, and Thompson Seedless varieties resisted attack by *U. necator* after ripening to a sugar content of 8 per cent. and upwards.

From the results of these studies it is concluded that temperature is the primary factor limiting the development of vine mildew, which is favoured by the moderate warmth prevailing in the coastal valleys of California. In the Imperial and Coachella

Valleys, where summer temperatures are high for long periods, the disease does not constitute an annual problem.

Groman (Ema). **Tumori bilja.** [Plant tumours.] *Zasht. Bilja* [*Plant Prot., Beograd*], *1953*, 15, pp. 1–11, 3 pl., 1953. [French summary.]

Plant tumours due to various animal parasites, fungi, bacteria, viruses, and synthetic hormonal preparations based on 2,4-D [cf. *R.A.M.*, 32, p. 648] are briefly described. In experiments at the Institute of Plant Protection, Zagreb, 2,4-D caused tumours on the stems and roots of sunflower, on the stems only of flax, and induced stem fasciation and root tumours on *Ranunculus arvensis*. Treated vines developed leaf symptoms reminiscent of those produced by court-noué [33, p. 582], due to one or several viruses. It is suggested that deranged hormone activity brought about by disturbances in plant metabolism may be responsible in certain cases for the development of court-noué.

Sugiyama (T.), Iwata (M.), & Yashiro (H.). **Magnesium deficiency in Grapes.**—*J. hort. Ass. Japan*, 21, pp. 161–164, 1952. [Abs. in *Rec. Res. Fac. Agric. Tokyo Univ.*, 3 (*1952–1953*), p. 3, 1954.]

During the summer of 1951 the lower leaves of vines in the Yamanashi Prefecture, Japan, displayed chlorotic symptoms and were found to be suffering from acute magnesium deficiency [cf. *R.A.M.*, 33, p. 11], the magnesium content being less than 0·25 per cent. of the dry weight. The apical leaves were normal. The disorder is attributed to the high calcium or potassium in the soils of the chlorotic vineyards, which interferes with the absorption of magnesium.

Symposium. Viruses and the protection of the Plant Kingdom. Supplement to the thirty-fourth annual report of the Quebec Society for the Protection of Plants. —pp. 67–184, 20 figs., 2 graphs, 1952. [Received 1954.]

At this symposium held in Quebec on 1st and 2nd October, 1952, D. J. MacLeod (pp. 87–96) reviewed the literature (104 titles) on the identification of potato viruses. In 1944 (Thesis, University of Cambridge) the author proposed a scheme for analysing and separating the viruses commonly infecting potato stocks. He divided them into six separable groups: (i) sap inoculable (*Datura stramonium* used as test plant) but not insect transmitted, e.g., potato aucuba mosaic and potato F and X [*R.A.M.*, 34, p. 55]; (ii) sap inoculable and aphid transmitted (by *Myzus persicae*), e.g., potato viruses A and Y, potato calico [strain of lucerne mosaic virus], potato leaf-rolling mosaic, and potato spindle tuber; (iii) leafhopper or thrips transmitted (separable by selecting the specific vector), e.g., potato green dwarf and yellow dwarf and tomato spotted wilt; (iv) aphid transmitted (*M. persicae*), e.g., leaf-roll; (v) dodder (*Cuscuta gronovii*) transmitted, e.g., aster yellows [34, p. 54] and potato witches' broom; and (vi) graft transmitted, e.g., potato streak and roll disease.

R. H. Larson discussed relationships between potato leaf roll strains (pp. 97–98) [33, p. 442] and described the induction of mutants in potato virus X by nitrogen mustard (pp. 99–100) from work carried out at the University of Wisconsin in collaboration with M. A. Stahmann and J. C. Walker. Test plants of *Nicotiana rustica* were exposed to nitrogen mustard [cf. 32, p. 6] for four to six hours at 20° C. after inoculation with a dilute preparation of the necrotic spot strain of potato virus, X, which had shown no apparent spontaneous mutation during a period of six years. The exposure was repeated four times at 24-hour intervals; five to seven days later reproducible mutants were isolated from single small chlorotic lesions; they did not revert to the original type after repeated transfer to healthy *N. rustica* plants. All the mutants precipitated specifically with antiserum of the original

virus strain. When inoculated to other solanaceous hosts only one mutant produced the necrotic lesions of the original strain.

G. H. Berkeley (pp. 101–115) contributed a review (64 titles) of the reactions of plants to virus infections. It is concluded that plant reaction to virus infection and multiplication results from metabolic disturbances of the host, primarily of the nucleo-protein metabolism.

Mutual adaptations in viruses and their hosts were discussed by F. O. Holmes (pp. 116–127). It is stressed that viruses evolve rapidly by differential multiplication of their mutant derivatives and quickly adapt themselves to their hosts. In contrast, plants evolve very slowly; wild hosts surviving virus attacks with less damage than most will persist, while the only protection for cultivated plants lies in continuous selection and maintenance of resistant varieties.

R. H. Bagnall (pp. 128–131) gave his views on hypersensitivity [32, p. 143] and its manifestation in potatoes. Descriptions are given of the two main types, acronecrosis [10, p. 746; 33, p. 552] caused by potato viruses A, B [a strain of X], C [a strain of Y], and X [23, p. 143], and acropetal necrosis [10, p. 746] caused by potato virus Y. Preliminary varietal trials held in 1951 [in New Brunswick: 32, p. 665] to determine the resistance of several varieties and seedlings to virus Y showed that they fell into two groups: the first, reacting fairly mildly to virus Y, included Green Mountain (40 per cent. infection), Irish Cobbler (26), Epicure (24), and Keswick (17); the second consisted of severe reactors, e.g., Warba, Katahdin, and Canadian Seedlings 41956 and F 4519, with percentage infections of 5, 6, 4, and 8, respectively. These results suggest that severe acropetal necrosis is a form of field resistance to potato virus Y. Serological tests indicated that the more severely reacting varieties contained a much lower concentration of virus in the sap than the mildly reacting tolerant varieties. The author concludes that there is every possibility of developing commercially satisfactory varieties of potato resistant to all the major potato viruses.

H. Genereux reviews (in French, pp. 132–144) the literature (43 titles) on the various methods of infection and spread of plant viruses. In Quebec insects are still the principal vectors of potato viruses [33, p. 466] and the degree of infection varies with their migration and numbers, climate, presence of primary hosts, and the susceptibility of the plants under cultivation. This explains the weak virus dissemination observed in some parts of the Province during the period under review (1945–1951).

B. Baribeau (in French, pp. 153–166) recapitulates the history and function of the potato certification scheme for the control of viruses in Canada. In 1952 less than 2 per cent. of the fields inspected in Quebec [loc. cit.] were rejected on account of virus infection, in comparison with 15 per cent. in 1942, and 78 per cent. were eligible for Foundation grades compared with 56 per cent. formerly. Such a scheme requires great efforts, precise and rigorous diagnosis and selection, and multiple aphid treatments.

A. Nantel describes (in French, pp. 167–180) the application and use of the electron microscope for the study of viruses.

Klesser (Patricia J.). **New records of Legume virus diseases in England.** *Plant Path.*, 3, 3, p. 84, 2 pl. (between pp. 86 and 87), 1954.

In the course of a survey made from 1948 to 1950 of the virus diseases of the Leguminosae occurring naturally in England new records made for this country were bean yellow mosaic [cf. *R.A.M.*, 33, p. 8] in French bean (*Phaseolus vulgaris*), broad bean, and *Medicago lupulina*, pea stunt (pea virus 6) in *M. lupulina*, alsike clover mosaic [cf. 30, p. 325] in *M. arabica*, and white clover mosaic [pea wilt + pea mottle viruses: cf. 31, p. 474] in lucerne, all found at or near Cambridge.

Rochow (W. F.). **Multiplication of unrelated plant viruses in double infections.**—*Diss. Abstr.*, 14, 11, pp. 1890–1891, 1954.

At Cornell University [Ithaca, New York], determinations were made of the ratio of the amount of a mild strain of potato virus X in the sap of tobacco plants doubly infected with this and an unrelated virus to that in sap from comparable plants infected by virus X alone, the latter being assayed mostly by means of local lesions on *Gomphrena globosa*. In leaves sampled in the acute stage of infection the ratio reached 10:1 with potato virus Y as the second virus, 6:1 with tobacco etch virus, and 2:1 with cucumber mosaic virus. Lucerne mosaic virus did not cause any change in the relative concentration of virus X but tobacco ring spot induced as much as a 50 per cent. decrease. These five viruses did not hamper the biological assay of virus X at the dilutions employed, though in combination with tobacco mosaic virus, X could only be assayed by serological methods. Precipitin tests showed at least a four-fold increase in virus X antigen in sap from leaves infected with both virus X and tobacco mosaic virus. In all cases where the relative concentration of virus X increased in double infections it was accompanied by an increase in symptom severity at the acute stage of infection. With simultaneous inoculation of viruses X and Y the ratio of X in the sap varied with the stage of infection, ratios of up to 10:1 being detected only in leaves in an acute stage of infection and up to 3:1 in those at the chronic stage; up to twice as much virus X was present as in singly inoculated leaves. Sap from the vein islets of X-infected leaves contained roughly six times and XY-infected leaves double the amount of active virus X than sap from the midribs and main laterals. Maximum increases in the amount of virus X in doubly infected plants appeared to occur only during the rapid phase of multiplication of virus Y. Large increases of virus X and severe symptoms of the acute stage of infection were lacking when Y-infected plants were inoculated with X.

Anderson (C. W.). **Cassia tora, a leguminous host of Tobacco etch virus.** *Plant Dis. Reptr.* 38, 11, pp. 736–738, 1954. [Multilithed.]

Infection of *Cassia tora* by tobacco etch virus [cf. *R.A.M.*, 33, p. 402] in the field is reported from Florida. In inoculation tests, using carborundum, at Florida Agricultural Experiment Station, Gainesville, young *C. tora* plants developed systemic infection by the *Cassia* strain and mild and severe strains of tobacco etch. Older plants failed to become infected systemically, but appear to do so in the field. Potato virus Y and the Black-eye cowpea mosaic virus caused local lesions.

C. tora, as well as *Physalis peruviana* [22, p. 227], could be used in immunological studies of tobacco etch virus, the former being of particular value in resisting systemic infection by several other viruses to which *P. peruviana* is susceptible.

The development of systemic necrotic patterns, which seriously complicate the making of accurate lesion counts, may, possibly, be avoided if tests are conducted under cooler conditions.

Brandes (J.). **Elektronenmikroskopischer Nachweis von Pflanzenviren in ihren Wirtszellen.** [Electron-microscopic demonstration of plant viruses in their host cells.] *Naturwissenschaften*, 42, 4, p. 101, 3 figs., 1955.

The electron-microscopic examination at the Biological Institute, Brunswick, of tobacco leaf material inoculated with tobacco mosaic virus revealed an unequal distribution of the particles in the tissues, some cells containing none or few while others were replete. The virus occurred mostly in the form of cell inclusions, presumably X bodies, composed of densely aggregated particles, which were much more numerous in the pale than in the dark zones of the leaf.

The potato bouquet (tobacco ring spot) virus [*R.A.M.*, 34, p. 245] appears to be

localized principally in the epidermal cells, which were completely filled with the spherical elements.

Bremer (H.), Karel, G.), Biyikoğlu (K.), Göksel (N.), & Petrak (F.). **Beiträge zur Kenntnis der parasitischen Pilze der Türkei. VII.** [Contributions to the knowledge of the parasitic fungi of Turkey. VII.]—*Rev. Fac. Sci. Univ. Istanbul*, Sér. B. 17. 4, pp. 277–288, 6 figs., 1952. [Turkish and English summaries. Received 1954.]

This further critically annotated list of Turkish parasitic fungi [cf. *R.A.M.*, 27, p. 349] comprises, *inter alia*, records of *Cycloconium oleaginum* on olive [C.M.I. map No. 183]; *Cladosporium fulvum* on tomato [No. 177], extending its range from south to central Anatolia; *Polythrincium* [*Cymadothea*] *trifolii* [*R.A.M.*, 27, p. 350], spreading eastwards; *Cercospora rubi* on *Rubus* sp. [14, p. 774], previously reported by Nattrass from Cyprus [17, p. 346]; *C. traversiana* on *Trigonella foenum-graecum* and *Heterosporium avenae* on oats, both apparently new to the Near East; *H. echinulatum* [28, p. 456] and *Alternaria dianthi* on *Dianthus* sp. [27, p. 351]; *Spondylocladium atrovirens* on potato advancing towards central Anatolia [27, p. 350]; *Fusarium solani* causing foot rot of sesame; and *Rhizoctonia* [*Corticium*] *solani* isolated from wilting *Impatiens balsamina* and *Achillea millefolium* and from healthy tomato and *Cynodon dactylon*, all at Ankara.

Clasterosporium mori, previously referred to *Cercospora bremeri* [29, p. 335], was observed in 1947 at Adana producing on the upper sides of mulberry leaves yellow or grey to greenish, ill-defined discolorations and on the under sides dense, velvety, black or greenish-black mats of uni- to quadricellular, somewhat crooked or gnarled, light olive-brown conidiophores, 12 to 40 by 4 to 6 μ, often provided with one or two apical, papilliform denticles; the oblong or cylindrical, two- to eight-, mostly six-celled straight or slightly curved conidia, measure 16 to 48 (mostly 20 to 40) by 4 to 6 or up to 7·5 μ.

Goulden (C. H.). **Progress Report 1949–1953, Cereal Crops Division, Central Experimental Farm, Ottawa.**—39 pp., 12 figs., 1955.

In this report [cf. *R.A.M.*, 29, p. 495] it is stated that the most promising breeding lines of the spring wheat at Ottawa resistant to leaf rust [*Puccinia triticina*: 34, p. 287] and stem rust [*P. graminis*: 34, p. 289] are some 400 F_5 lines from a cross between 4243–49–1 and Acadia, in which leaf rust resistance comes from Illinois 11 B 8 and stem rust resistance from McMurachy [loc. cit.].

New varieties of winter wheat licensed for sale in Canada since 1948 include Dawbul, resistant to loose smut [*Ustilago tritici*], and Richmond, resistant to some races of bunt [*Tilletia* spp.]. Wasatch [33, p. 205] is being grown to a limited extent in the Armstrong area of British Columbia, where dwarf bunt [*T. controversa*: 34, p. 30] is a problem. A dwarf bunt nursery is being established on a farm in Bruce County where dwarf bunt wheat was found in 1952. Factors for resistance to loose smut are being developed, Cornell 595 and Genesee being used freely as parents.

The Lanark oat variety is particularly adapted to areas in the Ottawa Valley where rust [*P. graminis*: 33, p. 709] is usually prevalent. Rodney [cf. 33, p. 718] is highly resistant to rusts [*Puccinia* spp.] and smuts [*Ustilago* spp.]

Vantmore barley, formerly known as Br. 1259–597, outyields Vantage [33, p. 589] in Manitoba and is more tolerant of root rots (mainly *Helminthosporium sativum*) [cf. 30, p. 507; 34, pp. 23, 143, *et passim*], leaf spot diseases (including *S. passerinii*), and smuts [*U.* spp.]. Brant, developed for adapted areas in Ontario, resists mildew [*Erysiphe graminis*: cf. 26, p. 386; 33, p. 531]. In barley breeding at Ottawa Anoidium [30, p. 507] and C.I. 7152 were used for resistance to loose smut [*U. nuda*]. Rabat for mildew resistance [loc. cit.], a Bolivia × Chevron selection for

rust resistance, and Anoidium, Rabat, and a Mensury-Newal-Peatland-Plush hybrid designated 3962–4 for root rot resistance.

In tests of the resistance of barley seedlings to *H. sativum*, using a modification of a method developed at Macdonald College, Quebec [33, p. 467], Anoidium, Rabat, and Vaughn were consistently resistant, and Olli, Wong, and Hannchen uniformly susceptible. Many selections made from hybrids such as Vantage × Rabat, Byng × Rabat, Anoidium × Rabat, and Anoidium × Fort were very tolerant. Flax rust [*Melampsora lini*: 32, p. 665] has decreased with the introduction of the varieties Rocket, Redwood, Sheyenne, Marine [33, p. 154], and Raja, which are immune from the races now prevalent. Varieties with some tolerance of pasmo disease [*Mycosphaerella linorum*: loc. cit.] include C.I. 1153, Crystal, Chinese, and the fibre varieties Concurrent and Rembrandt. In the breeding programmes some disease-resistant hybrids between fibre and oil varieties are being back-crossed to Cascade for rust resistance and Rembrandt for pasmo resistance.

The susceptibility of the Michelite field bean [*Phaseolus vulgaris*] to anthracnose [*Colletotrichum lindemuthianum*: 29, p. 496; 30, p. 15] and to halo and common bacterial blights [*Pseudomonas medicaginis* f. sp.] *phaseolicola* and *Xanthomonas phaseoli*: loc. cit.] appears to be increasing.

Foster (W. R.) & MacSwan (I. C.). **Report of Plant Pathology Branch.**—*Rep. B.C. Dep. Agric., 1953*, pp. CC62–CC66, 1954.

In this report [cf. *R.A.M.*, 33, p. 708] the following are given as the recommended materials for the pre-pink and pink sprays in the control of apple scab [*Venturia inaequalis*: loc. cit.] in British Columbia during 1954: (1) for hand gun sprayers, lime-sulphur (2 gals. in 100 gals.), or wettable sulphur (3 lb.), plus ferbam (1 lb.), and (2) for concentrate sprayers lime-sulphur (8 gals. per acre), or wettable sulphur (15 lb.), plus ferbam (5 lb.); and for the calyx and cover sprays (1) lime-sulphur (1·5 gals. per 100 gals.), or wettable sulphur (3 lb.), plus ferbam (1 or 2 lb.); and (2) lime-sulphur (8 gals.), or wettable sulphur (15 lb.), plus ferbam (5 or 10 lb.). Applied in gun sprayers to plots at Sumas on the Coast these sprays gave satisfactory control. In plots at Creston manzate gave the most clean fruit (50 per cent.) and captan was satisfactory except for some shot-holing on Delicious foliage. The application of a fungicide with the blossom-thinning spray increased the percentage of clean fruit.

Applications for the certification of strawberry plants [32, p. 173] totalled 69, of which 39 were accepted. The number of strawberry plants certified was approximately 3,000,000. Effective control of red stele [*Phytophthora fragariae*: 33, p. 709] by treatment of the soil with dithane D–14 was not secured [cf. 32, p. 71].

British Columbia remains virtually free from bacterial ring rot [*Corynebacterium sepedonicum*: loc. cit.] of potatoes. No potatoes entered for certification were rejected because of this disease. It was, however, detected in slight amounts on ten farms in the Fraser Valley, in White Rose potatoes grown for the commercial market from uncertified seed.

In a preliminary field test of two partial soil sterilizers for the control of *Phytophthora* root rot [*P. lateralis* and *P. cinnamomi*: 32, p. 521] of Lawson's cypress [*Chamaecyparis lawsoniana*] seven out of eight trees appeared to remain healthy from October to July in contaminated soil treated with chloropicrin, whereas eight in contaminated soil treated with dithane D–14 all died.

Fifth Annual Report of the Commonwealth Scientific and Industrial Research Organization for the year ending 30th June, 1953.—Canberra, 191 pp., 1953. [Received 1954.]

In the plants section (pp. 16–35) of this report [cf. *R.A.M.*, 33, p. 208] it is stated that an Early Carman potato stem tip free from potato virus X, obtained

by a method previously described [33, p. 46], has been clonally propagated and virus-free tubers will soon be available for distribution.

Preliminary studies on the control of tomato bacterial canker (*Corynebacterium michiganense*) with streptomycin [33, p. 330] indicated that the antibiotic is readily absorbed by the roots. In the leaf tissue it is remarkably stable and easily demonstrable by bioassay 63 days after treatment; it is not transferred to the young growing leaves. At concentrations above 4 p.p.m. it is highly phytotoxic. Treatment with 10 p.p.m. streptomycin for seven days, starting within 72 hours of inoculation, prevents wilting but does not kill the bacterium, which may still be isolated.

The application of a technique for determining the population density of infective particles of *Pythium* in soil at Dickson Experiment Station showed that most of the particles were intimately associated with the colloidal coating of the sand grains, about 1,000 grains per gm. being infested.

In rotation experiments in which wheat was sown in drums of soil artificially infested with the take-all fungus [*Ophiobolus graminis*: 32, p. 236; 34, p. 136] yields were higher following two years of oats, Wimmera rye [grass: *Lolium perenne*], or peas than in any of six other rotations.

In stored [apple] fruits an interaction was observed between Jonathan spot [33, p. 360] and [unspecified] breakdown, each tending to suppress the other. A correlation between the incidence of [unspecified] storage rots and mean fruit size, and other intercorrelated variables indicated a relation between fruit physiology and fungal development.

Thielaviopsis basicola was recorded on New Zealand Blue lupins (*Lupinus angustifolia*) [30, p. 21] at the Field Station, Applethorpe, for the first time in Queensland.

Tobacco plants inoculated with tobacco mosaic virus [16, p. 517] but having the necrotic type of resistance were usually killed by vascular necrosis at temperatures above 75° F. in Canberra experiments. At 100° F. typical mosaic mottle symptoms occurred. Tobacco yellow dwarf virus [30, p. 215] reduced rooting in cuttings by 50 per cent., the effect of frenching being similar. Frenching was widespread in four acres of tobacco at the Katherine Research Station, Northern Territory, affecting both yield and quality, and was also observed in the Manjimup area of Western Australia and in north Queensland. Blue mould [*Peronospora tabacina*: 27, p. 587] is still destructive in all areas. Trashy leaf, characterized by reduction in carbohydrates and increase in total nitrogen, causes considerable loss to the tobacco industry. A decrease of fluorescent compounds in affected leaves facilitates the estimation of trashiness during sampling.

Plant diseases. Corm rot of Bananas. Blackleg of Potatoes. Septoria spot of Citrus. —*Agric. Gaz. N.S.W.*, 64, 10, pp. 546–549, 4 figs., 1953.

Information on banana corm rot in New South Wales caused by various fungi [including *Clitocybe* sp.] is recapitulated [*R.A.M.*, 15, p. 238].

Potato black leg caused by *Bacterium carotovorum* [*Erwinia carotovora*: 34, p. 285] may cause severe losses, particularly when injured tubers are planted in wet soil. Healthy sets, preferably uncut, or cut as close to planting time as possible, should be planted in well-drained soils unlikely to be flooded, at a depth of 4 in. if the disease is liable to occur.

Plant diseases. Late blight of Celery. Bean rust. Two diseases of ornamentals. New plant diseases.—*Agric. Gaz. N.S.W.*, 65, 2, pp. 100–103, 2 figs., 1954.

Late blight of celery caused by *Septoria apii* and *S. apii-graveolentis* [*R.A.M.*, 29, p. 407] is probably the most widespread and destructive disease of the crop in New South Wales. Measures to prevent its development and minimize losses have already been published [loc. cit.].

Various strains of bean [*Phaseolus vulgaris*] rust (*Uromyces phaseoli typica*) [*U. appendiculatus*: 29, p. 497] occur in Australia, attacking both the dwarf and climbing varieties, including the previously resistant Westralia [31, p. 467]. In the absence of a variety resistant to all these strains control must be confined to early planting and the use of sulphur dusts or sprays.

Powdery mildew of begonia [*Oidium begoniae*: 33, p. 138] was observed for the first time in New South Wales in 1953 and spread rapidly throughout the metropolitan and coastal area, affecting the Rex varieties in particular, though tuberous *Begonia sutherlandii* was extremely susceptible. Azaleas [*Rhododendron*] of all ages, particularly in shaded positions, are also attacked by powdery mildew [*Oidium* sp.] in a few metropolitan districts. The potential importance of the disease is still unknown. Dusting with high grade sulphur or spraying with colloidal sulphur (1 oz. to 3 gals. water) several times at 10- to 14-day intervals is recommended for both diseases.

Diseases recorded for the first time in New South Wales during the six months ending 31st December, 1953, include *Selenophoma donacis* var. *stomaticola* on *Agropyron scabrum*, an *Agropyron* × wheat hybrid, and *Dactylis glomerata*; lily mosaic virus on garlic; *Sclerotinia sclerotiorum* on *Antirrhinum majus*; tomato spotted wilt virus on gladiolus and *Schizanthus wisetonensis*; cucumber mosaic virus on *Iberis amara*; *Cercospora* sp. on oleander; *C. rhododendri* on *Rhododendron* spp. and hybrids; *Septoria rubi* on boysenberry; and *Phytophthora cinnamomi* on *Ulex europaeus floropleno*.

Plant diseases. Spraying programmes for control of fungous diseases of coastal Peaches. Common scab of Potato. Spotted wilt of Iceland Poppies.—*Agric. Gaz. N.S.W.*, 65, 6, pp. 327–329, 4 figs., 1954.

Three composite spraying programmes are suggested for the protection, respectively, of early, mid-season, and late maturing peach varieties from brown rot (*Sclerotinia fructicola*) [cf. *R.A.M.*, 33, p. 733], leaf curl (*Taphrina deformans*) [33, p. 211], freckle (*Cladosporium carpophilum*) [23, p. 475], and rust (*Puccinia pruni-spinosae*) [29, p. 515] in the coastal districts of New South Wales. Bordeaux mixture at early bud-swell is followed by several applications of wettable or colloidal sulphur, or lime-sulphur.

Potato scab (*Actinomyces scabies*) [34, p. 285] is favoured by any treatment which renders a soil less acid, e.g., liming or ploughing-in of wood-ashes, and decreased by increasing the soil moisture. As most potato soils in the State are strongly acid, severe scabbing occurs only during dry seasons. Dipping 'seed' potatoes is an effective control measure where conditions are not too favourable for infection.

Tomato spotted wilt [virus] on Iceland poppies [*Papaver nudicaule*: 30, p. 216] causes stunting and yellowing of the plants; the leaves and stems become twisted, and a milky fluid exudes from water-soaked areas on the stem. Abnormalities may occur in the opening of the buds.

Plant diseases. Diseases of the cultivated Mushroom. Anthracnose of Beans.—*Agric. Gaz., N.S.W.*, 65, 8, pp. 426–429, 431, 7 figs., 1954.

Descriptions are given of the symptoms and control of a number of mushroom diseases recorded in New South Wales. Spores of *Mycogone perniciosa* [*R.A.M.*, 13, p. 356; cf. 34, p. 205] in the compost are killed by a peak temperature of 120° F. for six hours; infested casing soil should be sterilized. In indoor culture adequate ventilation and freedom from excessive humidity are important. Infected mushrooms should be destroyed immediately and the bed sites sterilized. Similar measures are recommended against brown spot, also known as fungus spot or dry

bubble (*Verticillium* spp.) [cf. loc. cit.; 25. p. 93]. Maintenance of temperature at 50° to 55° C. and control of flies assist in minimizing losses.

Mushrooms affected by mildew or cobweb disease (*Dactylium dendroides*) [cf. 31, p. 589] should be removed and the casing soil to a distance of six inches or more beyond the affected area sprayed with 4 per cent. formalin.

Damping-off or wilt (*Fusarium solani*) [cf. 29. p. 196] occurs occasionally, the original infection usually arising from the casing soil. Infested soil should be sterilized. Once the disease appears in a bed it cannot be eliminated but may be isolated by cutting a channel 9 in. wide down to the base of the bed and spraying the channel with 2 per cent. formalin.

Bean [*Phaseolus vulgaris*] crops free from anthracnose (*Colletotrichum lindemuthianum*) [33, p. 337; 34, p. 285] may be produced south of Gosford by growing the varieties Tweed Wonder, Wellington Wonder, and some lines of Brown Beauty, which resist strain 1; at Gosford and further north where strain 2 is found, all varieties are liable to be attacked. Selection of individual plants in the field, followed by tests of their progeny under glass and the building up of seed stocks has yielded a line of Brown Beauty completely resistant to strain 1. Breeding work, in which varieties resistant to both strains but commercially undesirable are crossed with susceptible commercial types, and the progeny tested for several generations, has produced several promising lines. Resistance to rust [*Uromyces appendiculatus*] is taken into consideration in these crosses.

Bates (G. R.). **Report of the Chief Botanist and Plant Pathologist for the year ending 30th September, 1953.**—*Rhod. agric. J.*, 51. 5, pp. 359–370, 1954.

In this report on plant disease work in Southern Rhodesia in 1952–3 [cf. *R.A.M.*, 31. p. 475] it is stated that the summer potato crop was affected by the most severe and widespread epidemic of late blight (*Phytophthora infestans*) [30, p. 485] yet experienced in the Colony. The disease was present in all parts except Matabeleland, and was particularly severe in the main production areas. Only the earliest plantings escaped damaging losses, and the late first-from-imported crop was an almost total failure. Where spraying was undertaken either the fungicide was applied too late or it was rendered useless by heavy, continuous rain. The disease also attacked the irrigation crops planted in March and April, causing some reduction of yields. Tuber infection occurred in rain-grown and irrigated potato crops, particularly those with overhead irrigation. Examination of isolations of *P. infestans* from all parts of the country showed that most belonged to strain D hitherto unrecorded in Africa, though A was also present [cf. 33, p. 250]. Severe leaf roll occurred in irrigated crops grown from certified South African seed.

Maize rust (*Puccinia polysora*) [33, p. 226] was discovered in the Lomagundi area in early March, and later was found in other localities, including the Mazoe district and the Sabi Valley; only in the last-named region, where infection was particularly severe on late-planted maize, were serious losses sustained. Leaf blight (*Helminthosporium turcicum*) [C.M.I. map No. 257] was exceptionally severe in several maize-growing districts, and caused heavy losses. It appeared earlier than usual, and was favoured by very wet weather in January and February. Both open pollinated and hybrid varieties were attacked, but the latter are the more susceptible.

New records included brown leaf spot (*Cercospora longipes*) of sugar-cane, fruit spot (*Cladosporium oxysporum*) of granadilla [*Passiflora edulis*], smut (*Tilletia echinosperma*) of *Setaria* sp., stem break (*Botrytis cinerea*) of *Hibiscus cannabinus*, tomato late blight (*Phytophthora infestans*) [No. 109], rice blast (*Piricularia oryzae*) [No. 51], and barley loose smut (*Ustilago nuda*) [cf. *R.A.M.*, 30. p. 490]. The stem break of *H. cannabinus* occurred in experimental plantings grown from imported seed; varieties from Cuba and Egypt were severely attacked, but a Brazilian variety

remained unaffected. Rice blast was present in an irrigation project situated on the Zambesi in the extreme north-west of the Colony. In tobacco seed-beds the most prevalent trouble was stunting and yellow patch, associated with excessive alkalinity of the soil and, in many cases, with a too liberal use of fertilizer. Spot necrosis, hitherto attributed to phosphate deficiency [cf. 31, p. 475] was widely present, mainly on heavy soils and after prolonged wet periods late in the season.

Blight of field peas (*Septoria pisi*) [loc. cit.] caused losses in the Umtali district among plantings of the Greenfeast variety. As a result of the discovery of bacterial blight [*Pseudomonas pisi*: C.M.I. map No. 253] of peas in the seed-producing areas of South Africa, several local crops grown from imported seed were closely inspected, but no sign of the disease was found.

The use of resistant varieties has given effective control of sugar-cane smut (*Ustilago scitaminea*) [*R.A.M.*, 31, p. 475], which is now only of minor importance on the Triangle Sugar Estate. Brown spot (*Cercospora longipes*) [cf. 32, p. 669] was widespread in all plantings of C.P. 29 291, and later spread to Co. 281. Other varieties were less severely affected. The disease did not appear to have any serious effect on yield.

Lodging (*Colletotrichum curvatum*) [31, p. 475] again caused much damage to sunn hemp [*Crotalaria juncea*]. Three dahlia plants affected by kromnek [tomato spotted wilt virus: 28, p. 210] were found in Salisbury and one in Bulawayo. The season was very favourable to the development of maize rust (*Puccinia sorghi*) [C.M.I. map No. 279] and blight (*Helminthosporium turcicum*) [see above, p. 436]. It is becoming increasingly evident that maize leaf diseases are of considerable importance as regards crop yields.

The average germination for all samples of maize was 97 per cent., as compared with 98 per cent. for samples supplied by the Seed Maize Association. Five per cent. of the samples were severely, and 22 per cent. mildly infected by *Fusarium* spp. Incidence of *Diplodia zeae* was negligible. *Colletotrichum graminicola* was present in several samples.

[An abridged account of this work appears in *Rep. Dir. Res. S. Rhod., 1952–3*, pp. 52–54, 1954.]

Moseman (A. H.). **Report of the Chief of the Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, 1953.**—129 pp., 1953.

Most of the items dealing with plant disease work that occur in this valuable record of research in the United States have already been noticed in this *Review* from various sources [cf. *R.A.M.*, 31, p. 360; 32, pp. 360, 372, 651, 674, *et passim*].

Report of the Iowa Agricultural Experiment Station for the two years July 1, 1951, to June 30, 1953.—30 pp., [? 1953. Received 1955.]

In the section on maize and other grains (pp. 5–8) of this report [cf. *R.A.M.*, 33, p. 142] it is stated that two diseases of unusual interest and importance in Iowa during 1952 were black stem of oats (*Leptosphaeria avenaria*) [32, p. 248; 33, p. 149] and black bundle of maize (*Cephalosporium acremonium*) [cf. 26, p. 392] which reduced yields by 15 and 7 per cent., respectively. Of seven fungicides tested on a crown rust [*Puccinia coronata*]-susceptible oat variety, parzate, manzate, and dithane D-14 increased yields by 21, 21, and 14 bush. per acre [33, p. 142], respectively, and the test weight by 5, 4, and 3 lb. per bush. Of 600 barley introductions tested at Iowa State College 125 had less than 5 per cent. scab [*Gibberella zeae*: 30, p. 482] but only two less than 2 per cent. Several promising selections combined resistance to smut [*Ustilago* spp.: 33, p. 148] with other desirable characters.

In the section on hay and pasture (pp. 15–18) J. W. Baxter reports that the lucerne diseases present in 1952 were summer black stem and leaf spot [*Ascochyta*

imperfecta: 33, p. 234], spring black stem and leaf spot [*Pseudopeziza medicaginis*: 33, p. 431], *Pseudoplea* leaf spot [*P. briosiana*: 33, p. 730], downy mildew [*Peronospora trifoliorum*: 28, p. 577], and bacterial wilt [*Corynebacterium insidiosum*: 33, p. 32] and the principal red clover diseases summer black stem and leaf spot [*Phoma trifolii*: 33, p. 676], *Stemphylium* leaf spot [*S. sarciniforme*: loc. cit.], rust [*Uromyces trifolii*: loc. cit.], and powdery mildew [*Erysiphe polygoni*: loc. cit.]. C. S. Reddy reports that orthocide 406 [captan] was the best seed treatment for bluegrass [*Poa* spp.], thiram for bromegrass [*Bromus* spp.], and copper-8-quinolinolate or captan (orthocide 75), for red clover and lucerne, all the treatments increasing yield.

Stapp (C.). **Zur Pathogenität fluorescierender Bakterien.** [On the pathogenicity of fluorescent bacteria.] *Beitr. Biol. Pfl.*, 31, 2-3, pp. 515-524, 1955.

Fluorescent bacteria are of considerable importance as agents of plant diseases. They are able to invade healthy, uninjured plant tissue through the stomata, and must therefore be considered as genuine parasites. Comparative tests made by the author on all the fluorescent bacteria available to him, both plant-pathogenic and non-pathogenic, as well as a large number of strains freshly isolated from soil, air, and water and tested immediately for pathogenicity, failed to show that the strains common in those media are pathogenic to plants. They cannot, therefore, be held responsible for the sudden outbreaks of bacterial diseases among cultivated plants. Only one strain of many tested of *Pseudomonas aeruginosa* [*R.A.M.*, 31, p. 270], that isolated from a human abscess and pathogenic also to mice, was pathogenic to potato tubers.

Katznelson (H.). **Production of pyruvate from 6-phosphogluconate by bacterial plant pathogens and legume bacteria.** *Nature, Lond.*, 175, 4456, pp. 551–552, 1955.

In the course of investigations at the Bacteriology Division, Department of Agriculture, Ottawa, on the metabolism of phytopathogenic and root-nodule bacteria it was observed that all of the latter and some of the former namely, the representative species *Xanthomonas phaseoli*, *Pseudomonas angulata*, and *Agrobacterium* [*Bacterium*] *rubi*, produced pyruvate from 6-phosphogluconate and from glucose-6-phosphate plus triphosphopyridine nucleotide. All species tested of these three genera were capable of inducing this reaction but not *Corynebacterium fascians*, *C. flaccumfaciens* [*R.A.M.*, 34, p. 286], *C. michiganense*, *Erwinia carotovora*, or *E. amylovora*.

Kelman (A.). **The relationship of pathogenicity of Pseudomonas solanacearum to colony appearance in a tetrazolium medium.** —*Phytopathology*, 44, 12, pp. 693–695, 1954.

At the Department of Plant Pathology, North Carolina State College, mutants of *Pseudomonas solanacearum*, the agent of southern bacterial wilt, were easily recognizable when suspensions from stock cultures of isolates from potato, tobacco, tomato, groundnut, and chilli plants were streaked on a medium consisting of 1 per cent. peptone, 0·1 per cent. casein hydrolysate, 0·5 per cent. glucose, 1·7 per cent. agar, and 0·005 per cent. triphenyl tetrazolium chloride in 1 l. distilled water, and examined with obliquely transmitted light. The most common mutant formed a circular, butyrous, deep red colony with a narrow, bluish border, contrasting with the irregularly round, fluidal, white, pink-centred colony of the normal or wild type of the organism. The results of inoculation tests on Rutgers tomato seedlings [*R.A.M.*, 32, p. 547] demonstrated a relationship between colony appearance on the above-mentioned medium and pathogenicity, cultures derived from the mutant causing little or no damage, whereas those from the normal type were very injurious.

The mutants herein described are stated to resemble those observed by Okabe in Formosa and Japan (*Ann. phytopath. Soc. Japan*, 7, pp. 95–104, 1947: *Res. Bull. Shizukoa agric. Coll.*, 1, pp. 41–59, 1949).

Galanti (M.) & Manil (P.). **Action antibiotique d'extraits de plantes supérieures. Quelques observations expérimentales sur le genre Geranium.** [Antibiotic action of extracts of higher plants. Some experimental observations on the genus *Geranium*.] *C.R. Soc. Biol., Paris*, 48, 21–22, pp. 1892–1894, 1954.

Among plants of 14 genera studied for their antibiotic action on five bacteria, only *Geranium* spp. gave positive results. The antagonism of *G. pratense* and *G. platypetalum* to *Agrobacterium* [*Bacterium*] *tumefaciens* was of the same order as that of terramycin at a concentration of 50 parts per million.

Donald (D. A.). **The Cacao industry of Western Samoa.**—*Trop. Agriculture, Trin.*, 30, 4–6, pp. 73–74, 1953.

One tree of Lafi No. 7 [cf. *R.A.M.*, 32, p. 424] cacao variety produced 288 pods (averaging 6 oz. wet beans per pod) in 1950 in Western Samoa. During the four years during which it has been under observation no case of black pod (*Phytophthora palmivora*) [loc. cit.] arose. *P. palmivora* canker and *Corticium salmonicolor* [26, p. 188] are of some importance in the territory. They are treated regularly on the estates and incidence is low.

Cherewick (W. J.). **Smut diseases of cultivated plants in Canada.**—*Publ. Dep. Agric. Can.* 887, 58 pp., 13 figs., 1953.

This is the first general account of the smut diseases of cultivated plants in Canada published since that of Güssow and Conners (*Bull. Dep. Agric. Can.* 81, 1929). The economic importance of the smuts is emphasized, the annual loss in cereals alone being over $4,000,000, besides which food contaminated by the spores may be toxic to man and animals. The life-histories of typical smut fungi are described and illustrated, their classification outlined, and descriptions of the diseases they cause and their control are given. A bibliography of 165 titles is appended.

Verona (O.) & Perini (D.). **Qualche indagine sopra i danni prodotti da cause avverse alla coltura del Frumento (1950–51).** [Some investigations of the damage induced by conditions adverse to Wheat cultivation (1950–1).]—Reprinted from *Riv. Econ. agrar.*, 8, 2, 36 pp., 2 diags., 2 graphs, 1953. [English and French summaries. Received 1954.]

Of the damage sustained by wheat in Italy and Sardinia in 1950–1 due to parasitic agents the greatest was caused by the rusts *Puccinia glumarum*, *P. graminis*, and *P. triticina* [*R.A.M.*, 25, p. 551] which were together responsible for a loss of about 2,000,000 quintals. Bunt (*Tilletia levis* [*T. foetida*], *T. tritici* [*T. caries*], *T. intermedia*, and *T. triticoides* [30, p. 315]) reduced yields by about 929,000 quintals; smut (*Ustilago tritici*) 205,000; foot rot (*Ophiobolus graminis* [25, p. 251], *Leptosphaeria* [*Cercosporella*] *herpotrichoides* [loc. cit.], and *Fusarium*) 1,551,000; and minor pathogens such as *Erysiphe graminis* 80,000. These approximate data were compiled from questionnaires submitted to agricultural inspectors in each province.

Pon (D. S.), Townsend (C. E.), Wessman (G. E.), Schmitt (C. G.), & Kingsolver (C. H.). **A Xanthomonas parasitic on uredia of cereal rusts.**—*Phytopathology*, 44, 12, pp. 707–710, 3 figs., 1 graph, 1954.

During the summer of 1952 stem rust (*Puccinia graminis*) pustules surrounded by dark, watersoaked margins were observed on wheat near Frederick, Maryland, and subsequent examination revealed a hitherto undescribed lysing bacterium, herein

designated *Xanthomonas uredovorus* n.sp., which was found to be parasitic on the uredospores of the rust, reducing their numbers or eliminating them entirely. The dark brown to black, marginal pigmentation often extended into the sorus and was visible on the reverse side of the leaf at the centre of severely infected pustules. The symptoms developed within three days after artificial infection of pustules on plants held at 30° C. during the day and at 22° overnight. In inoculation experiments the bacterium parasitized *P. graminis* on barley, oats, and rye as well as on wheat, and *P. rubigo-vera* [*P. triticina*] on wheat and rye. *P. triticina* was less prone than *P. graminis* to attack by *X. uredovorus*, only 0·4 per cent. of the 450 pustules inoculated undergoing lysis in contrast to 85 per cent. of 412 of *P. graminis*, of which races 17, 38, and 56 were equally susceptible. In 1952 agar cultures of the bacterium lost pathogenicity in about a month at laboratory temperatures ranging from 26° to 35° C., but their progeny retained the original morphological characters. In 1953 virulence was lost after three months at 21° to 31°. However, pathogenic cultures were obtained from infected pustules on dried leaf tissue after five months' storage in 1952 at 26° to 35°.

X. uredovorus is soil-borne and one means of its dissemination is by splashing rains, while the spread of bacteria to erupted pustules, which are more susceptible than unerupted, is effected by contaminated uredospores. The organism, a Gram-negative, monotrichous rod, 1·5 by 0·6 μ, grows best at 30° and well at 37°, forming yellow to orange-yellow colonies on various media; liquefying gelatin; reducing and coagulating litmus milk; reducing nitrates; producing indole; and evolving acid but no gas from cellobiose, dulcitol, dextrose, dextrin, fructose, galactose, glycerol, inositol, lactose, maltose, mannitol, mannose, rhammose, salicin, sorbitol, sucrose, trehalose, and xylose: after 72 hours acid from arabinose.

Veenenbos (J. A. J.). **Resultaat van de graanroest-enquêten 1952–54.** [Result of the cereal rust inquiries 1952–54.]—Abs. in *Tijdschr. PlZiekt.*, 61, 1, pp. 25–26, 1955.

Cereal rusts (*Puccinia* spp.) assumed a severe form in Holland in 1952, but in 1953 and 1954 the outbreaks were of only moderate intensity. Rye was attacked by *P. dispersa* in all three years and by *P. graminis* in the first two, the latter, however, being of minor importance. *P. triticina* was more prevalent on wheat than *P. glumarum*, but the yellow rust was more injurious, causing necrosis of the leaf tissue round the uredosori. As in the case of rye, *P. graminis* was relatively innocuous. *P. simplex* [*P. hordei*] was the predominant species on winter and summer barley, with a restricted incidence of infection by *P. glumarum* in 1952. No damage was caused by *P. coronata*, the only species found on oats.

Jamalainen (E. A.). **Black rust and occurrence of Berberidaceae in Finland.**—*Maataloust. Aikakausk.*, 25, pp. 47–53, 1 map, 1953.

As a result of the epiphytotic of *Puccinia graminis* on wheat in Finland in 1951 [*R.A.M.*, 31, p. 234], eradication of the common barberry is to be legally enforced. This will not necessarily preclude the possibility of further rust epidemics, since in favourable years spores may be carried by the wind from southern Scandinavia where barberry bushes are common.

Fitzgerald (P. J.). **Inheritance of resistance to certain physiologic races of leaf rust of Wheat (Puccinia rubigovera tritici Eriks.).**—*Diss. Abstr.*, 14, 12, pp. 2173–2174, 1954.

At Purdue University [Lafayette, Indiana] the author investigated the inheritance of resistance to leaf rust (*Puccinia rubigo-vera tritici*) [*P. triticina*: *R.A.M.*, 33, pp. 472, 663] in wheat selection 3369–61–1–1–10–8 which has been highly resistant to all races with which it was tested except for one biotype of race 30.

It is believed to have originated from an outcross of a Wabash × American Banner hybrid with an unknown resistant wheat. In this study it was crossed with American Banner, Butler, Mediterranean, Wabash, and Malakoff, and races 9, 15, and 76 of *P. triticina* were used.

Resistance to race 9 was controlled by a single, partially dominant gene and to races 15 and 76 by a single, dominant gene, the two being closely linked. The crosses with Mediterranean and Wabash demonstrated that resistance to race 9 is governed by genes at two loci. Mediterranean and Wabash carry recessive genes at both loci with one gene controlling resistance and the other determining susceptibility, the former being epistatic to the latter. At the locus corresponding to the former, selection 3369 carries a dominant gene for susceptibility and at the other locus a dominant gene for resistance epistatic to the dominant gene for susceptibility. Resistance to race 76 in 3369 and Malakoff is controlled by a dominant gene inherited independently. An earlier genetic study of 3369 demonstrated that resistance to race 5 is also controlled by a single dominant gene and that to race 65 by duplicate recessive genes.

Individual plants of 3369 possessing the most complete resistance to these five races appear to possess the genotype $Lr._4$ $Lr._4$; $lr._5$ $lr._5$; $lr._6$ $lr._6$; $Lr._7$ $Lr._7$; $Lr._9$ $Lr._9$; $Lr._8$ $Lr._8$; dominant $Lr._4$ controls resistance to race 5, the recessive genes $lr._5$ $lr._5$ or $lr._6$ $lr._6$ control resistance to race 65, and the dominant genes $Lr._7$, $Lr._9$, and $Lr._8$ govern resistance to races 76, 15, and 9, respectively.

Király (Z.) & Farkas (G. L.). **Über die parasitogen induzierte Atmungssteigerung beim Weizen.** [On the enhanced respiration induced by parasitism in Wheat.] —*Naturwissenschaften*, 42, 8, pp. 213–214, 1955.

In experiments at the Research Institute for Agriculture of the Academy of Sciences, Martonvásár, Hungary, the intensity of respiration in wheat was greatly increased by inoculation with *Puccinia graminis* and *Erysiphe graminis* [cf. *R.A.M.*, 33, p. 106 *et passim*]. It was found that the glycolysis-inhibitors, mono-iodo-acetic acid and sodium fluoride, act in the same way on both healthy and infected plants, appreciably restricting the uptake of oxygen, whereas malonic acid affects the former more than the latter (70 as compared with 30 to 40 per cent. inhibition). It is believed, as a result of these observations, that new biochemical mechanisms are concerned in the toxinogenic respiration of plants.

Manners (J. G.) & Gandy (Doreen G.). **A study of the effect of mildew infection on the reaction of Wheat varieties to brown rust.**—*Ann. appl. Biol.*, 41, 3, pp. 393–404, 1 pl., 5 figs., 1954.

In studies at the Department of Botany, University of Southampton, mildew (*Erysiphe graminis tritici*) increased the susceptibility of the Malakoff and Democrat wheat varieties to rust (*Puccinia triticina* race 66) [*R.A.M.*, 15, p. 707] under normal environmental conditions, though not, except in isolated conditions, that of Mediterranean or Hussar. High light intensities (daylight plus artificial light) enhanced the effect of mildew on the rust reaction of Democrat. The susceptibility of Webster was unaffected or was reduced by the presence of mildew. All the varieties were normally susceptible to mildew and semi-resistant to the rust.

There was a marked tendency for the diseases to develop on different parts of the leaf in all varieties, and when a leaf was severely mildewed the development of *P. triticina* was sometimes almost completely inhibited though the spores of the two fungi germinated well in each other's presence and the two fungi were sometimes found in the same cell. The effect of mildew on rust was confined to pustules within 1 mm. of mildew colonies.

As the photosynthetic tissue in green islands remains active longer than that

in surrounding tissues and the chlorophyll content is exceptionally high, local increases in the total protein and in specific proteins occur. The green islands associated with the mycelium of *E. graminis* are larger than those associated with *P. triticina*. According to Gassner and Franke [13, p. 566] the susceptibility of a wheat variety to rust is based on the presence of certain specific proteins in the host. In highly resistant varieties these proteins may be lacking or present in such small amounts that the presence of mildew fails to increase the concentration sufficiently to alter the rust reaction. Susceptibility is increased most frequently and consistently in semi-resistant varieties, such as Democrat and Mediterranean, whereas on the more resistant varieties Malakoff and Webster increase occurred only when the plants were grown in a good light, i.e. when conditions probably favoured protein synthesis. It is concluded that the results obtained support Gassner's view [cf. 17, p. 664].

Last (F. T.). **The effect of time of application of nitrogenous fertilizer on powdery mildew of winter Wheat.**—*Ann. appl. Biol.*, 41, 3, pp. 381–392, 15 graphs, 1954.

In an experiment carried out in an unheated greenhouse at Rothamsted Experimental Station Red Standard (Squareheads type) winter wheat seed treated with ceresan was sown in poor soil in pots on 30th October, 1950, the seedlings later being reduced to five per pot, and given various nitrogen treatments. The plants were naturally infected by air-borne inoculum of *Erysiphe graminis*. Disease was assessed by the author's infection-index method [cf. *R.A.M.*, 33, p. 147] in which the infection-index $= \frac{y \times 100}{a_1+a_2+a_3}$ . . . pustules per 100 sq. cm., y being the total number of asexual pustules on the leaf blades of the main stem with a total area of $a_1+a_2+a_3$ sq. cm. The total number of pustules is the sum of the geometric means of the replicates for each leaf position.

Pustules were first observed on 9th February, 1951, and were randomly scattered among the plants, regardless of treatments. By early March most plants were infected; but few had more than one pustule, usually present on one of the oldest leaves. The number of pustules increased rapidly, reaching a maximum of 31 per 100 sq. cm. at the end of March on the plants given five units of nitrogen on 20th January (1 unit = 0·3 gm. sodium nitrate plus 0·4 gm. calcium nitrate, applied in solution), the only treatment in which the plants were not still nitrogen-deficient. From the end of March the weather favoured spread, and only the nutritional status of the plant governed the extent of disease. The curves showing successive changes in the infection index of plants given nitrogen (four or five units) on successively later dates, 20th January, 10th April, and 8th May, were similar in shape but differed widely in absolute values, each rising to a maximum and then declining, the maxima being successively higher with increasing delay in application of nitrogen. Thus, these figures for the three application dates, respectively, were 30, 220, and 254 in the series receiving no nitrogen at sowing and five units later, and 30, 92, and 151 in those given one unit at sowing and four later. Nitrogen applied in January had little effect on the amount of the disease, whereas in April and May it increased the disease five to six times.

Perithecia were first observed on 1st June. The time of nitrogen application did not affect the date of their appearance, though their number increased with increasing delay in nitrogen application. When nitrogen was added to nitrogen-deficient plants, the already mature leaves which had resisted infection became susceptible.

In a second experiment (1952–3), when application of nitrogen was made after the flag leaf had emerged, the infection-index rose steadily without reaching a

peak, and increased susceptibility was not associated with an increased relative growth rate, as it was when nitrogen was applied earlier.

These experiments indicate that nitrogen should not be applied late to soil in which wheat is growing when there is a risk of infection by *E. graminis*.

Noulard (L.). **Recherches sur la carie du Froment (Tilletia tritici). Première note.** [Researches on Wheat bunt (*Tilletia tritici*). First note.]—*Parasitica*, 9, 2, pp. 43–53, 1953.

In studies carried out at the State Research Station for the Improvement of Crop Plants, Gembloux, Belgium [see next abstract], 147 varieties of wheat were inoculated with a Belgian strain of *Tilletia tritici* [*T. caries*]. Among the November sowings, Nebred C.I. 10.094, Oro C.I. 8.220, Hymar C.I. 11.605 (all from the United States), four *Triticum spelta* varieties (one from Bulgaria and three from Germany), and one form of *Triticum* × *Agropyron* (from Russia) had 0 per cent. infection; Marmin C.I. 11.502, Yogo C.I. 8.030, Hussar C.I. 4.843 (all from the United States), Kanhard sel. Buck, Cheg 85 × 51.52 (from Argentina), and Carstens V had under 10 per cent. infection. Among the March sowings, *Triticum timopheevi* and *T. timococcum* had no infection, while Hope C.I. 12.008, Renown Sask. 1.960, *T. durum* Senatore Cappeli, Cheg 85 × 51.52, Rival C.I. 11.708, Redman C.I. 12.496, Regent Sask. 1.977, and H44 had under 10 per cent. infection.

Noulard (L.). **Recherches sur la carie du Froment (Tilletia tritici). Deuxième note.** [Researches on Wheat bunt (*Tilletia tritici*). Second note.]—*Parasitica*, 10, 2, pp. 27–42, 1954.

Continuing his studies on varietal resistance of wheat to *Tilletia tritici* [*T. caries*: see preceding abstract], the author in 1952–3 at Gembloux, Belgium, tested 200 varieties against a Belgian strain of the fungus. The results of two years' experiments with winter wheat showed that *Triticum timococcum*; two forms of *Aegilops* sp. × durum wheat; *T. spelta albospicatum*; *T. compactum* (Hymar C.I. 11.605); and Ashkof, Nebred C.I. 10.094, and Oro C.I. 8.220 wheats were completely resistant (0 per cent. infection); while Marmin C.I. 11.502; Yogo C.I. 8.030; Martin C.I. 4.463; Hussar C.I. 4.843; Cheg 85 × 51.52; and Kanhard Sel Buck, were resistant (0·1 to 10 per cent. infection). In three years' tests with spring varieties, *T. timococcum* and *T. timopheevi* were completely resistant, while Cappelli durum wheat, Renown Sask. 1.960, and Cheg 85 × 51.52 were resistant (0·1 to 10 per cent. infection). When spring wheat was sown on different dates, the sowings made at the end of February and during the first fortnight in March had the highest levels of infection.

Heyne (E. G.) & Hansing (E. D.). **Inheritance of resistance to loose smut of Wheat in the crosses of Kawvale × Clarkan.**—*Phytopathology*, 45, 1, pp. 8–10, 1955.

At the Kansas Agricultural Experiment Station, F_1, F_2, and F_3 data from reciprocal crosses of the resistant Kawvale and the susceptible Clarkan variety, and the off-spring of F_3 back-crosses to each parent were studied for reaction to race 11 of loose smut (*Ustilago tritici*) [*R.A.M.*, 33, p. 473]. The resistance of Kawvale was found to be dominant and is probably attributable to at least two factors, a major conferring high resistance (0 to 10 per cent. infection) and one or more minor ones giving a moderate degree (11 to 45). The combination of all factors resulted in immunity from race 11.

Inoculation of florets at the time of pollination indicated that resistance to race 11 is governed by the embryonic genetic constitution of the F_1 plant rather than the genetic constitution of the female parent.

There was no apparent linkage between loose smut and response to leaf rust [*Puccinia triticina*: 32, p. 369] or awn habit.

Plasman (A.). **Note sur deux techniques d'inoculation de plantules de Froment avec Ophiobolus graminis Sacc. et application de l'une d'elles à un test de sensibilité de lignées de Froment de printemps.** [A note on two methods of inoculating young Wheat plants with *Ophiobolus graminis* Sacc. and the application of one of them to a test of the susceptibility of spring Wheat varieties.]—*Parasitica*, 10, 2, pp. 43–50, 1954.

Two methods of inoculating young wheat plants with *Ophiobolus graminis* are described. In the first, 20 ml. of a nutrient solution are introduced into a tube closed at one end and measuring 18 by 300 mm. A glass tube measuring 5 by 100 mm. is inserted, filled with absorbent cotton which protrudes at the top, the protruding part being as wide as the diameter of the larger tube. The wadding at the top of the glass tube is thus constantly provided with nutrient solution. The culture tubes are then plugged with cotton wool and sterilized for 20 minutes at 120° C. Wheat seeds disinfected by 17 hours' immersion in calcium hypochlorite solution are washed and placed aseptically in a Petri dish, on an agar medium. After one week at about 18° the young seedlings (any showing signs of disease having been discarded) are placed aseptically on the absorbent cotton in the culture tubes, and inoculated by placing a small piece of a culture of *O. graminis* near the collar.

The second method, devised specially for testing the susceptibility to *O. graminis* of different wheat varieties, consists in inoculating plants in earthenware containers measuring $0{\cdot}5 \times 0{\cdot}35 \times 0{\cdot}07$ m. The substrate, a coarse mixture of Rhine gravel and vermiculite in equal quantities, the vermiculite being adjusted to pH 3, washed in running water and dried by heating, is then placed in the containers and 1,400 ml. of nutrient solution added, which brings the pH value to about 5. All the containers are brought to a constant weight, and 160 seeds sown in each, the inoculum being placed in contact with the seeds; in the controls a mixture of sterilized barley and oat seeds is used in place of the inoculum. The receptacles are watered daily, to maintain humidity at a constant level in all pots. This method gives rapid results, though not strictly comparable with field trials. As, however, the conditions in which the *in vitro* experiment is carried out are extremely favourable to the fungus, varieties demonstrated to be resistant are likely to be at least equally so in conditions less favourable to the parasite.

Hedén (Å.). **Undersökning rörande förekomsten av rotdödarsvampen (Ophiobolus graminis Sacc.) i Skaraborgs län 1953.** [Investigation concerning the occurrence of the root-killer fungus (*Ophiobolus graminis* Sacc.) in the Skaraborg district 1953.]—*Växtskyddsnotiser, Stockh., 1954*, 4, pp. 50–52, 1954.

A small-scale investigation in the Skaraborg district of Sweden in the summer of 1953 was undertaken partly to determine the possible relation of inappropriate crop rotations and other factors in the increasing frequency of cereal foot rots, and partly to obtain a general idea of the incidence of *Ophiobolus graminis* [*R.A.M.*, 33, p. 343], the most important of the associated fungi in the locality. The 60 fields (57 winter and three summer wheat) examined fell into three groups, of which (I) contained 0 to 20 diseased plants per 10 sq. m. or 0·5 per cent. (41 fields), (II) 20 to 100 (0·5 to 2·5 per cent.), and (III) $>$ 100 ($>$ 2·5 per cent.), each of the two latter groups being represented by 11 fields. In nine of the fields in group (III) there was a maximum interval of a year between the preceding (susceptible) barley crop and the wheat, but in each of the other two groups only five of the rotations were unsuitable, so that some other factor must have been involved in the development of the pathogen. Van der Laar's observations in Holland [10, p. 446] showed that some common pasture grasses, e.g., *Phleum pratense*, and the ubiquitous *Agropyron repens* are susceptible to *O. graminis*. In two of the five cases in group

(II) in which more than two years had elapsed between cereal crops, the wheat was preceded by pasture grasses with a heavy admixture of *A. repens* in one season. It appears probable, therefore, that the grasses were concerned in the perpetuation of the fungus, since only one wheat and one barley crop had been included in an eight-year rotation.

The great importance of the haulms in the overwintering and increase of the fungus has long been recognized. After threshing in 1952, the haulms on one half of a winter wheat field were ploughed under and those on the other half burnt. In 1953 the incidence of infection on the former section was 50 to 60 per cent. compared with negligible damage (four plants per 10 sq. m.) on the latter.

Of the total of 60 fields comprised in the investigation, 12 had been notified to the Plant Protection Institute as damaged by *O. graminis*, while the remainder were selected at random; of the latter, seven (15 per cent.) were infected.

The results of the inquiry are considered to support previous observations as to the influence of rotation on foot rot. An interval of two years between susceptible crops, including wheat, barley, rye, and pasture grasses, should suffice provided the fields are kept reasonably free of *A. repens*.

Hanson (E. W.) & Christensen (J. J.). **The black point disease of Wheat in the United States.**—*Tech. Bull. Minn. agric. Exp. Sta.* 206, 30 pp., 2 figs., 1953.

The black point disease of wheat, known as kernel smudge in Canada, is very common in Minnesota and adjoining States, particularly affecting durum wheats. In an examination of over 1,000 samples of wheat seed from 1935 to 1943 the percentages of black point kernels ranged from 0 to 95 per cent. Mindum and Kubanka were the most susceptible varieties while Marquis, Ceres and Regent were the most resistant. The disease was favoured by warm, humid weather.

The predominant organisms found associated with discoloured seed were *Helminthosporium* spp. and *Alternaria* spp. [*R.A.M.*, 31, p. 112], although many seeds other than those with black points were infected with undetermined fungal mycelium. Seed treatment increased germination, improving vigour and stand, and is recommended for all wheat sown in Minnesota.

Domsch (K. H.). **Über den Einfluss photoperiodischer Behandlung auf die Befallsintensität beim Gerstenmehltau. Keimungsphysiologische Untersuchungen mit Sporen von Erysiphe graminis.** [On the influence of photoperiodic treatment on the intensity of Barley mildew infection. Studies on the physiology of germination of *Erysiphe graminis* spores.]—*Arch. Mikrobiol.*, 19, 3, pp. 287–318, 34 graphs, 1953; 20, 2, pp. 163–175, 4 graphs, 1954. [Received February–March, 1955.]

Studies are described from the Institute of Plant Physiology, University of Göttingen, Germany, on the influence of day length and plant age on the intensity of infection by *Erysiphe graminis* on Morgenrot barley [cf. *R.A.M.*, 33, p. 23], involving the operation of five distinct light-darkness rhythms ranging from two hours of light and 22 of darkness to two of darkness and 22 of light. A short period (seven hours) of daylight induced the maximum and a long one (17) the minimum of infection. Under all conditions of photoperiodicity young leaves were severely attacked, while older ones generally sustained little damage, and etiolation produced a similar effect. Photoperiodic after-effects could be demonstrated in the constitution of the host for at least eight days. The pathogenicity of the fungus was not directly influenced by photoperiodic treatment of the host or by light in general.

In the foregoing inoculation experiments it was observed that the greater the density of the conidial suspension, the lower were the incidence of infection and the conidial germination percentage. The conidia themselves excreted into the

medium a substance capable of causing reversible inhibition of germination, which may also be limited by oxygen deficiency and a high carbonic acid content.

NICHOLSON (G.). **Oat and Barley varieties recommended for 1954 sowings.**—*Agric. Gaz. N.S.W.*, 64, 12, pp. 637–640, 1 map, 1953. [Received 1954.]

Notes are given on the characteristics, including disease resistance, of the oat varieties recommended for 1954 sowing in the various zones of New South Wales [*R.A.M.*, 28, p. 569]. Lampton is stated to be somewhat resistant to stem rust [*Puccinia graminis*: 32, p. 75] and far more resistant to smut [*Ustilago avenae* and *U. kolleri*: loc. cit. and next abstract] than White Tartarian. A few recommended barley varieties are listed.

MARTIN (R. H.) & VON MENGERSEN (F.). **Smut in Oats—breeding for resistance.**—*Agric. Gaz. N.S.W.*, 65, 3, pp. 155–157, 2 figs., 1954.

Smut (*Ustilago avenae* and *U. kolleri*) is probably the most serious disease of oats in New South Wales [see preceding abstract]; during the past ten years it has caused the widespread abandonment of Fulghum, the best grazing or dual purpose variety in the State. Notes are given on the progress made in breeding for smut resistance. The varieties Acacia, Ballidu, and Bunya are resistant and Belar, Brigalow, Dale, Gidgee, Guyra, Lampton [loc. cit.], Mulga, and Sunrise moderately so [cf. *R.A.M.*, 29, p. 497]. Unfortunately Victoria and its derivatives can only be used to a limited extent owing to their susceptibility to *Helminthosporium victoriae* [33, p. 666].

WILLIAMS (W.) & VERMA (U. N.). **Investigations on resistance to disease among species of the genus Avena. I. Resistance to physiologic races of Ustilago avenae and U. kolleri.**—*Ann. appl. Biol.*, 41, 3, pp. 405–416, 1954.

In studies at King's College, Newcastle upon Tyne, in 1951 and 1952, 53 samples representing species of *Avena* were tested in the greenhouse and the field for resistance to infection by four cultures each of oat loose smut (*Ustilago avenae*) and covered smut (*U. kolleri*) by inoculation of the grain with dry spores or with a spore suspension applied by partial vacuum.

Of the diploid and tetraploid species tested, five of 37 samples of *A. strigosa* ssp. *strigosa* [*R.A.M.* 34, p. 139] were completely resistant (no infected ears) to six of the cultures and two to five of them; three samples of ssp. *barbata* [loc. cit.] and one of ssp. *abyssinica* were resistant to all available races. Tests on differential oat varieties indicated that at least six races (two of *U. avenae* and four of *U. kolleri*) were present in the isolates used.

The results obtained demonstrate conclusively the presence of disease resistance in the lower chromosome group of *Avena*. The production of resistant, amphidiploid hybrids for gene transference, and the use of this technique in crop improvement necessitates a thorough investigation of possible parental species both for the detection of resistant genes and the determination of the range of polymorphism in respect of such genes. The data obtained show clearly the importance of fully appreciating the degree of variability in these self-fertilizing species and subspecies. No assumption of resistance or susceptibility should be made for even a representative specimen of any one species. Material for hybridization should be tested beforehand on an individual basis and not on a specific one.

It was also found that morphologically identical individuals of *A. s.* ssp. *strigosa* displayed a different pattern of resistance to the races under test. This demonstrates the importance of making a genotypic analysis of plants before they are hybridized. Further, the existence of non-morphological variations within varieties may easily lead to the selection of lines within a single variety which

behave differently towards the same race of the pathogen, thus giving an erroneus picture of race specialization.

Adequate precautions must, therefore, be taken if a satisfactory world list of physiologic races is to be made, and periodic checking of the differential hosts appears to be indispensable. The differentials should be 'pure-lined' before use, and to secure uniformity the work should be centralized.

The field experiments also indicated that as a result of fluctuations in the environmental conditions smut infection results may differ in different years. Difficulties arose in identifying the races owing to the inadequate number of tester varieties. It seems that the present list of differentials needs to be greatly extended.

Leben (C.), Arny (D. C.), & Keitt (G. W.). **Effectiveness of certain antibiotics for the control of seed-borne diseases of small grain.**—*Phytopathology*, 44, 12, pp. 704–709, 1954.

In further trials at the Wisconsin Agricultural Experiment Station seed treatment with helixins A, B, and C [*R.A.M.*, 33, p. 225], crystalline antimycin A-35 [34, p. 238], and crude helixin reduced the incidence of *Helminthosporium victoriae* in Vicland oats from 18 to between 2 and 6 per cent., the corresponding figure for ceresan M [34, p. 223] at 0·5 oz. per bush. being > 1. Helixin B at a dosage of 0·6 mg. per gm. was effective against Victoria blight only when carried in ethanol at the rate of 0·05 ml. per gm., but it completely eliminated infection by *Ustilago kolleri* and *U. avenae* in Canadian oats when used at a concentration of 1·25 mg. per mg. in a carrier of ethylene glycol (0·08 ml. per gm.) or a mixture of 43 parts of the same compound, seven of tween 20 [32, p. 273], and 50 of water at 0·04 ml. per gm. Water-soluble helixin at 1·25 mg. per gm. of seed reduced germination by 40 per cent. The percentages of smutted plants in the untreated lots and those disinfected with ceresan M were 10·7 and 0, respectively. Carried in the mixture, helixin B (1·25 mg.) also gave absolute control of *Tilletia foetida* on Sturgeon wheat as compared with 6·3 and 0·2 per cent. in the control and ceresan-treated lots, respectively.

Tveit (M.) & Moore (M. B.). **Isolates of Chaetomium that protect Oats from Helminthosporium victoriae.**—*Phytopathology*, 44, 12, pp. 686–689, 1 fig., 1954.

At the Department of Plant Pathology, University of Minnesota, isolates of *Chaetomium globosum*, *C. cochlioides*, and an unidentified *C.* sp. from oats seed produced in Brazil were antagonistic to various fungi, e.g., *Helminthosporium*, *Fusarium*, *Alternaria*, and *Rhizoctonia* spp., and bacteria, including *Erwinia carotovora*, in potato dextrose agar cultures, and also protected oats seedlings from natural or artificial infection by *H. victoriae* [*R.A.M.*, 32, p. 552; C.M.I. map No. 267]. The effect was more pronounced at low and moderate than at high temperatures but was noticeable throughout the experimental range (18° to 30° C.) and under all the conditions tested, including non-sterile soil. Both the pathogen and its antagonists survived for more than three months in soil kept alternately moist and dry and in which several generations of seedlings were grown, the protective influence of *C.* spp. persisting throughout the period. These results suggest that, once established in the soil, the latter may exert their inhibitory effect on *H. victoriae* for a considerable period, thereby affording a possible partial explanation of the absence of severe damage from Victoria blight in Brazil.

Paddock (W. C.). **Histological study of suscept-pathogen relationships between Helminthosporium victoriae M. and M. and seedling Oat leaves.**—*Mem. Cornell agric. Exp. Sta.* 315, 63 pp., 13 pl., 1953.

The essential results of this study have already been noticed from another source [*R.A.M.*, 32, p. 545].

Loo (Y. H.) & Lewis (R. W.). **Alkaloid formation in ergot sclerotia.**—*Science*, 121, 3141, pp. 367–368, 1 fig., 1955.

In studies at the Lilly Research Laboratories, Indianapolis, Indiana, and at Michigan State College, East Lansing, on alkaloid formation in the sclerotia of *Claviceps purpurea*, a plot of tetraploid Rosen rye [*R.A.M.*, 32, p. 478] was inoculated on 5th and 6th June, 1954, by spraying the flowers each day with a sugar spore suspension of the fungus. Samples of 200 or more heads were collected at intervals 8 to 26 days after inoculation and dried for two days at 60° to 80° C., many of the ears being dissected to secure all the sclerotia in each.

The results showed that the ergot alkaloids are largely synthesized in the fungus during the later stages of sclerotial development. In samples collected eight or ten days after inoculation, in which no pigment and sclerotia had formed, no lysergic acid could be detected. Traces of the alkaloids appeared 12 days after inoculation, the amount gradually increasing to a maximum on the 19th day, when the weight of the fungus was still increasing [cf. 34, p. 224].

Gorter (G. J. M. A.). **Studies on the spread and control of the streak disease of Maize.**—*Sci. Bull. Dep. Agric. S. Afr.* 341, 20 pp., 8 figs., 1953.

This bulletin describes the distribution and dissemination of maize streak virus in South Africa [*R.A.M.*, 26, pp. 194, 331], the A strain being predominant and the only known form of the virus in the Transvaal. Two species of wild grasses are infected in the field, viz., *Eragrostis aspera* and *Urochloa panicoides*, although many more were shown to be susceptible experimentally. Resistance in wheat, another alternate host, is only found in Canadian varieties.

Experimental results indicate that the vector (*Cicadulina mbila*) may be more effectively excluded from growing maize by a bare fallow strip than by a barrier crop.

The only maize varieties possessing resistance to streak disease were Peruvian and the P×H hybrid. The most promising crosses resulting from attempts to transfer this resistance to higher yielding susceptible varieties were those between susceptible white dents and the resistant P×H. In field trials they proved to have a yielding capacity equal to that of the susceptible parent, but out-yielded the latter in localities where the incidence of maize streak was high.

Daran (D. V.). **Studies in Sclerospora maydis. Physiology of parasitism.**—*J. sci. Res. Indonesia*, 2, 1, pp. 1–9, 1953.

Maize plants affected by *Sclerospora maydis* [*R.A.M.*, 29, p. 256] become irreversibly wilted, the leaf tissues are disorganized and the chlorophyll disintegrated. The seedling stage is the most susceptible and is associated with a high pentose and hexose content, which is not found in more mature plants.

The conidia are viable for eight hours at high temperatures and low humidity, and up to 24 hours at lower temperatures and high humidity.

An extract from diseased leaves contains a pectic enzyme similar to that obtained from *Bacterium aroideae* [a strain of *Erwinia carotovora*: 31, p. 594].

Long (J. K.) & Roberts (E. A.). **New dip treatment for control of green mould in Oranges.**—*Agric. Gaz. N.S.W.*, 65, 8, pp. 394–395, 412–413, 3 figs., 1954.

Effective control of green mould (*Penicillium digitatum*) on oranges was obtained at Gosford, New South Wales [*R.A.M.*, 34, p. 297], using sodium *o*-phenyl-phenate. The fruit is dipped for two minutes in a washing tank containing 2 lb. commercial chemical (73 per cent.) in 10 gals. water at a temperature not exceeding 90° F. Rind injury may be avoided by maintaining the solution at pH 11·7 to 12

by the addition of sodium hydroxide or the alkaline detergents 'M.1' or 'M.3'; the reaction should be checked and adjusted at frequent intervals. The fruit is then rinsed in a second tank or sprayed with water. In a commercial trial with 20,000 cases the cost of the treatment was estimated at 0·9*d.* per case. The used solution can, moreover, be employed for general disinfection purposes in the packing-shed. The best results are obtained on fruit free from serious injury and treated as soon as possible after picking.

Delleré (R.). **Résultats d'observations et d'expérimentations sur la biologie de deux fruticoles (Penicillium digitatum et P. italicum).** [Results of observations and experiments on the biology of two fruit-inhabiting organisms (*Penicillium digitatum* and *P. italicum*).]—*Parasitica*, 9, 2, pp. 59–64, 1 pl., 1953.

Studies at the State Laboratory of Plant Pathology, Gembloux, Belgium, of the germination and sporulation of *Penicillium digitatum* and *P. italicum* and of the mode of infection of citrus fruits by these fungi demonstrated that the spores of both are unable to germinate in double-distilled sterile water. Modification of the osmotic pressure of a synthetic culture medium failed to induce germination. On sterile orange juice *P. italicum* germinated more rapidly than *P. digitatum* and was less affected by low temperatures. The amount of infection that developed on oranges at different points of inoculation varied greatly. Penetration did not take place by mechanical means, for a thin covering of collodion provided effective protection of citrus fruits against contact infection by both organisms.

Sporulation of *P. digitatum* but not of *P. italicum* was inhibited by the metabolic products of an infected orange. In an atmosphere containing a high concentration of carbon dioxide sporulation of both fungi was greatly retarded.

Ruggieri (G.). **La lotta contro il 'mal secco' degli Agrumi.** [The control of mal secco of Citrus.]—Reprinted from *G. Agric.*, *1953*, 30, 7 pp., 1 pl., 1953. [Received 1954.]

At the Citrus Experiment Station, Acireale, Sicily, 200 sour orange seedlings about 18 months old and apparently free from mal secco (*Deuterophoma tracheiphila*) [*R.A.M.*, 34, p. 33] were sprayed every 15 days from 1st October [? 1952] to the end of January [? 1953] with 9 per cent. Caffaro plus the sticker Cano at 250 gm. to 100 l. Another 200 seedlings remained untreated as controls. Conditions on the whole were unfavourable to infection although the disease was extremely serious during 1952. None of the treated seedlings was affected and only six of the untreated contracted mal secco between March and May, 1953.

It is evident that, in order to be effective, treatments should be applied when the plant is most susceptible to infection, i.e. from November to February, and whenever temperature and humidity favour the development of *D. tracheiphila*.

Chowdhury (S.). **Citrus scab in Assam and its control.**—*Sci. & Cult.*, 20, 8, pp. 391–393, 1 fig., 1955.

Observations conducted at the Plant Pathological Laboratory, Jorhat, Assam, during the last few years have shown that *Citrus jambhiri* and *C. grandis* [*C. maxima*] are comparatively less susceptible to scab (*Elsinoe fawcetti*) [*R.A.M.*, 34, p. 82] than other citrus fruits, while loose-skinned mandarin orange (*C. reticulata*) is not attacked. Grapefruit is partially resistant. In field tests during the course of three years in an orchard selected for the severity of the disease, trees sprayed immediately after the appearance of each flush of leaves with Bordeaux mixture plus 0·5 per cent. resin, a Bordeaux-oil emulsion, or perenox with albolineum, using

a high pressure foot pump, were all free from the disease while on the unsprayed infection was severe.

Roldan (E. F.) & Luczon (C. V.). **Phytophthora blight of ornamental Palmera Palm seedlings (Chrysalidocarpus lutescens Wendl.).**—*Philipp. J. For.*, 9 (*1953*), 1–4, pp. 43–53, 2 pl., 1954.

In September, 1950, numerous seedlings of the ornamental palmera palm (*Chrysalidocarpus lutescens*) in forest nursery beds at the Division of Forest Investigation, College, Laguna, Philippines, were affected by a blight caused by *Phytophthora palmivora*. The minute, watersoaked, later dark brown, circular spots, increased rapidly under cool, moist conditions until all the leaves, and often the growing point, were affected and the plant died. Under unfavourable conditions the lesions remained localized and new foliage was unaffected. Leaves of healthy seedlings, wound-inoculated with the pathogen, developed lesions two days later; within about a week they were completely blighted, and in about a fortnight some of the seedlings died. The fungus was reisolated readily from the leaves.

The fungus is soil-borne and also survives in the form of chlamydospores in plant refuse; it probably reaches the leaves in soil particles during nursery operations and spreads to other plants by wind, tools, or water splashes. It is suggested that control measures should comprise burning all infected leaves at the first sign of infection and spraying the seedlings with Bordeaux mixture at least twice a week if conditions favour an epidemic. Care should be taken in watering, and overcrowding avoided in the nursery.

Wijbrans (J. R.). **Het stamrot van de Oliepalm.** [Stem rot of the Oil Palm.]—*Bergcultures*, 24, 5, pp. 112–113, 115–117, 119–121, 123–124, 8 figs., 1955. [English and Indonesian summaries.]

This study on stem rot of the oil palm, which is stated to have increased on the east coast of Sumatra during the post-war years, is preceded by a foreword by K. B. Boedijn. The first symptom is a wilt of the outer leaf whorls, which gradually spreads to the younger foliage; at an advanced stage of the disease only the most recently formed leaves and the central spear remain erect, while all the other leaf stalks bend and break, hanging against the stem and forming a tent or cloak. Meanwhile, the still living leaves assume a pale yellow-green tinge and the palm soon dies unless, as frequently happens, it is blown down before the development of external symptoms, in which case a discoloration and disintegration of the stem tissues can be detected round the fracture at the base or elsewhere.

Sections of diseased palms often bear the sporophores of *Ganoderma laccatum*, sometimes accompanied by the closely related *G. tropicum*. Other species found on dead palms include *G. applanatum* [*R.A.M.*, 9, p. 649 *et passim*], *Fomes noxius* [16, p. 160; 28, p. 163], and *G. cochlear*. The classification of *G.* spp. is complicated. *G. laccatum* is frequently cited as a synonym of *G. lucidum*, which may be used as the designation of a group comprising *G. laccatum*, *G. tropicum*, and *G. cochlear*, all three species being shiny in contrast to the dull surface of *G. applanatum*. *G. lucidum* is a facultative parasite, assuming an aggressive form only on trees weakened by injuries and adverse environmental factors, and its present wide distribution in Sumatra is attributed to the enforced neglect of the plantations and impracticability of replanting for three to eight years during and after the war. Rehabilitation is a slow process and in many cases a return to the pre-war level of maintenance presented great difficulty. Control consists mainly in the application of measures to prevent the spread of the stem rot by destruction of the fruit bodies and diseased palms. At the same time every possible step should be taken to improve general growing conditions and fortify the natural resistance of the healthy trees.

Barat (M. H.). **Défense des cultures. Études sur les maladies du Caféier et des arbres d'ombrage dans les plantations de la côte est de Madagascar.** [Crop protection. Studies on the diseases of Coffee and shade trees in the plantations on the east coast of Madagascar.]—*Rech. agron. Madagascar* 2, *C.R. 1953*, pp. 135–144, 11 figs., 1954.

An account is given of the symptoms, causal organism, and control (by the usual methods) of the serious root rot of coffee on the eastern coast of Madagascar, caused by *Clitocybe tabescens* [cf. *R.A.M.*, 32, p. 698], together with a list of other hosts attacked locally. The symptoms on coffee are identical with those caused by *Armillariella* [*Armillaria*] *fuscipes* [18, p. 452]. The *robusta* coffees are more resistant than the Kouilou. Of the shade trees, *Inga dulcis* exhibits remarkable resistance, but for replacing the very susceptible *Albizzia* spp., *Adenanthera pavonina*, also highly resistant, is preferred.

Moreau (C.) & Moreau (Mireille). **Succession des flores fongiques dans un pourridié du Caféier à Madagascar.** [Succession of fungal floras in a root rot of Coffee in Madagascar.]—*Mém. Inst. sci. Madagascar*, Sér. B., 5 (*1954*), pp. 1–6, 1955.

In January, 1953, the authors received at the Muséum National d'Histoire Naturelle, Paris, from Amicitia, eastern Madagascar, material from two *robusta* coffee plants affected by root rot [see preceding abstract]. The disease started with the death of the shade trees (usually *Albizzia*). The coffee trees near them, formerly healthy and vigorous, soon became chlorotic, and the leaves drooped, turned yellow, and fell before they had completely withered. The bark was cracked and emitted gum. Death ensued some months later. Part of the material came from a tree 12 to 15 years old which appeared to have been recently attacked, but was still living and bore chlorotic leaves and a few fruits; the remainder came from a five-year-old tree that had died a fortnight before and was leafless.

Listed in increasing order of decomposition of the wood in which they were present the fungi found were as follows. In both lots of material *Glomerella cingulata* was present, an account of which has already appeared [*R.A.M.*, 34, p. 148]. One small root of the less severely affected plant yielded *Armillariella* [*Armillaria*] *mellea*, while the tap-root gave *Haplographium bicolor*; from the superficial part of a small root a *Ceratocystis* was obtained; a severely rotted root gave *Circinella* sp., *Penicillium* sp., *Cladosporium herbarum*, *Trichoderma viride*, and again *H. bicolor*.

In the more severely rotted sample the tap-root yielded *Fusarium solani* and *H. bicolor*, the secondary roots *F. solani*, *T. viride*, *H. bicolor*, and *Aspergillus niger*, and the rhizomorphs *P. vermiculatum*, *Nigrospora oryzae*, and *H. bicolor*. The small, partially decomposed roots gave *T. viride*, *Cephalosporium* sp. and (once) *F. solani*.

In the rhizosphere soil [loc. cit.] the fungi found included *G. cingulata*, *F.* spp., and *H. bicolor*. In all, 39 species were isolated from the soil, including the following possible parasites of coffee: *Sclerotium bataticola* [*Macrophomina phaseoli*], a sterile mycelium resembling that of *Rosellinia necatrix*, a *Fusarium* sp. near *F. oxysporum*, and *F. solani*.

Fraselle (J. V.), Vallaeys (G.), & De Knop (O.). **La lutte contre la trachéomycose du Caféier à Yangambi et le problème que pose actuellement cette maladie au Congo belge.** [The control of tracheomycosis of Coffee at Yangambi, and the problem presented by this disease in the Belgian Congo to-day.]—*Bull. Inform. Inst. Étud. agron. Congo belge*, 2, 6, pp. 373–394, 10 figs., 1953.

During 1949, certain *robusta* coffee plantings at Yangambi, Belgian Congo, developed tracheomycosis caused by *Gibberella* [*xylarioides*: *R.A.M.*, 29, p. 617; 33, p. 412] and month by month the condition grew worse. In March, 1950, control

measures were put into operation, all dead or affected trees being extirpated. In August, the disease reappeared on a large scale, and all affected trees were tagged, uprooted, and burnt *in situ*. This practice has remained the main principle of the control methods employed [33, p. 556]. The disease develops with great rapidity, death usually ensuing two or three weeks after the appearance of the first symptoms. The interval at which the trees are inspected depends on this, the aim being to reduce spread as much as possible. At Yangambi monthly inspections have given good results over a period of three years, but more frequent ones would probably be even more satisfactory.

Outbreaks have been identified in about 15 localities, mostly in the Eastern Province, especially near Paulis-Rungu; others have been reported from Kasai and Katanga. In only about five plantations has the disease reached epiphytotic proportions, and in these it may have been present for a number of years. The problem is regarded as a limited one, and it is expected that the control methods adopted will prove effective, practical, and inexpensive.

Saccas (A. M.). **La fusariose des fruits des Caféiers en Oubangui-Chari due à Fusarium equiseti var. intermedeum n. var.** [Fusariosis of the fruits of the Coffee bushes in Oubangui-Chari due to *Fusarium equiseti* var. *intermedium* n.var.]—*Agron. trop., Nogent*, 10, 1, pp. 43-59, 7 figs., 2 graphs, 1955. [English and Spanish summaries.]

After inspection tours in the east and west of Oubangui-Chari in French Equatorial Africa it was reported that a fungus disease of the young coffee berries which had been observed in the eastern districts, particularly Koundji (Kembé) and Niakari (Bangassou), since 1950, was, in 1953, causing a crop loss of 40 per cent. On plots of *Coffea robusta* and *C. arabica* at the Boukoko Experimental Station the same disease led to a loss of from 3 to 10 per cent. of the young fruits. In Lobay most plantations were affected. The extent of the damage depends entirely on the dampness of the atmosphere.

The berries are attacked throughout the growing season, though most heavily in the early part, by a *Fusarium*. Infection starts in the fruit stalk and is followed by the rapid death of the berry. The mycelium blocks the vascular tissues leading to the seeds, causing them to blacken and shrivel; they are finally covered by a dirty white, floury mould.

The wide diversity of its macroconidia, their measurements and the number of septa (one to six, mostly three), the relatively feeble colonies, the rarity of chlamydospores, and the absence of pionnotes and sporodochia permit the conclusion that the fungus responsible is a new variety which it is proposed to name *Fusarium equiseti* var. *intermedium* [without a Latin diagnosis]. The average measurements of the macroconidia on coffee berries were: 1-septate 24·5 by 3·3 (18 to 31 by 3 to 4) μ; 2-septate 23·3 by 3·64 (20 to 25 by 3·5 to 4·5) μ; 3-septate 29·5 by 3·7 (20·5 to 49 by 3 to 4·5) μ; 4-septate 40·4 by 4 (35 to 46 by 3·5 to 4·5) μ; 5-septate 46·39 by 4·17 (37 to 57 by 3·4 to 4·8) μ. The conidia germinate in a damp medium between 20° and 33° C., the optimum being 29°. At 35° germination is inhibited; at 40° the conidia die within 24 hours.

Copper salts of 0·1 to 1 per cent. concentration inhibited germination; 0·05 per cent. was only partially inhibitory. Copper sprays (not exceeding 1 per cent. copper) immediately after petal fall and repeated twice at intervals of 20 to 30 days, may, therefore, give protection and limit the loss.

Bitancourt (A. A.). **As doenças do Cafeeiro na Costa do Marfim (África Ocidental Francesa).** [Coffee diseases on the coast of Marfim (French West Africa).] – *Biológico*, 20, 12, pp. 205–222, 8 figs., 1 map, 1954.

Following a brief sketch of the geographical, botanical, and agricultural con-

ditions prevailing on the coast of Marfim, French West Africa, and of the methods of coffee cultivation practised, the author fully describes its two principal fungal diseases, rust (*Hemileia vastatrix*) [C.M.I. map No. 5] and tracheomycosis (*Gibberella xylarioides*) [*R.A.M.*, 33, p. 413] and gives shorter accounts of the root rots caused by *Ganoderma*, *Fomes*, *Phellinus*, *Leptoporus* [*Polyporus*], and *Polyporus* spp.; zonal leaf spot, attributed by G. L. Fawcett in Puerto Rico (*Bull. P.R. agric. Exp. Sta.* 17, 1915) and Abbott in Peru [*R.A.M.*, 9, p. 63] to *Cylindrosporium* [*Cephalosporium*] sp.; and cercosporiosis (*Cercospora coffeicola*) [C.M.I. map No. 59], both the last-named being of minor importance.

H. vastatrix was reported for the first time on the coast of Marfim in September, 1953, on *Coffea liberica* and the small- and large-leaved varieties of *C. canephora*. The rust was observed exclusively in the vicinity of dwellings and along roadsides, where severely diseased trees alternated with perfectly healthy ones.

Tracheomycosis has been spreading rapidly through the territory since 1948, causing heavy damage in certain areas, e.g., Daloa, where 50 to 100 per cent. of the trees are infected. The small-leaved varieties of *C. canephora* are more susceptible than the large-leaved, while some of the various physiologic races of the causal organism are also pathogenic to *C. liberica*. Regarding the identity of the pathogen the author considers that the lesions in the xylem are suggestive of *Ceratostomella* and related genera. Moreover, the agent of Dutch elm disease [*C. ulmi*] is transmitted by Coleoptera, and H. Jacques-Félix (*Bull. sci. Minist. Colon. Sect. Agric. trop.* 5, 1954) has shown that of 46 coffee trees affected by tracheomycosis, 43 were parasitized by the Cerambycid *Bixadus*, while, conversely, only four trees infested by the insect (probably one of the principal vectors) were free from the disease. Plant pathologists of the Institute of Education and Tropical Researches state that a species of *Thielaviopsis*, one of the imperfect states of *Ceratostomella*, is not infrequently isolated from the wood of trees suffering from tracheomycosis.

Mendes (H. C.) & Franco (C. M.). **Nota sôbre a aplicação de 'nugreen' a fôlhas de Cafeeiros apresentando sintomas de carência de nitrogênio.** [Note on the application of 'nugreen' to Coffee leaves presenting symptoms of nitrogen deficiency.]—*Bol. Suptda Serv. Café, S. Paulo*, 29, 329, pp. 17–20, 1954. [English summary.]

In experiments at the Agronomic Institute, Campinas, São Paulo, Brazil, the response of Bourbon coffee plants growing in nutrient solutions and showing typical symptoms of nitrogen deficiency [*R.A.M.*, 30, p. 156] to spraying or wiping the leaves with nugreen (urea) solutions at 0·8, 1·76, and 2·64 per cent. nitrogen was very slight even at the maximum concentration, and did not become noticeable until 30 days after application. The method is evidently unsuitable, therefore, for the correction of nitrogen deficiency in coffee.

Holdeman (Q. L.) & Graham (T. W.). **Effect of the sting nematode on expression of Fusarium wilt in Cotton.**—*Phytopathology*, 44, 12, pp. 683–685, 1954.

At the South Carolina Agricultural Experiment Station greenhouse tests were performed to determine the relation of the sting nematode (*Belonolaimus gracilis*) to the severity of cotton wilt (*Fusarium oxysporum* f. *vasinfectum*) [*F. vasinfectum*] in the resistant Coker 100 WR and the susceptible Hurley's Rowden varieties. A preliminary note on the results has already appeared [*R.A.M.*, 32, p. 251]. It is clear that the nematode greatly facilitates the development of the disease in both groups of plants, although the exact manner in which it lowers resistance has not yet been ascertained. It does not appear, however, to consist merely in injury to the root cortex and consequent provision of a channel of entry for the fungus. When the latter or the nematode alone was used as inoculum no infection occurred in Coker 100 WR.

Roseberg (D. W.) & Barrack (A. L.). **The electron microscopy of a bacteriophage attacking Xanthomonas malvacearum.**—*Phytopathology*, 45, 1, pp. 49–51, 1 fig., 1955.

A bacteriophage attacking *Xanthomonas malvacearum*, the agent of bacterial blight [blackarm] of cotton [*R.A.M.*, 10, p. 662; 18, p. 249], was isolated at College Station, Texas, from two-year-old dried diseased leaves, apparently for the first time in the United States. The phage is stable in nutrient broth cultures at room temperature and withstands desiccation in association with its bacterial host in cotton leaf tissue for at least four years. The phage particles are spherical, about 27 mμ in diameter, and devoid of distinct tails; they were shown by electron microscope studies to be absorbed in 30 to 45 minutes on the bacterial cells, some 90 per cent. of which undergo lysis in four hours. Not until 12 days had elapsed was any growth of *X. malvacearum* detected when bacteriophage-reacted cultures were poured on a potato dextrose agar surface. These preliminary observations suggest that bacteriophage isolates from Texas and New Mexico may prove useful in the identification of strains of the bacterium occurring throughout the cotton belt.

Shver (E.). Порошковидные препараты для борьбы с гоммозом Хлопчатника [Dust preparations for the control of Cotton gummosis.] -Хлопководство [*Cotton Raising*], 5, 2, pp. 24–26, 1955.

As a result of the experiments conducted in a number of localities in the U.S.S.R. in 1953 and 1954 treatment of cotton seed with 20 per cent. copper trichlorophenolate (7 kg. per t[on] of seed) is recommended for the control of gummosis [blackarm (*Xanthomonas malvacearum*): *R.A.M.*, 34, p. 35] and root rot [unspecified: cf. 11, p. 41]. The percentage of infection with *X. malvacearum* per plot of cotton from treated seed in 1953 ranged from 0 to 18·6 for 20 per cent. copper trichlorophenolate as against 1·4 to 66·2 for formalin and 1·7 to 47·6 for granosan. The corresponding figures in 1954 were 0 to 5·4, 0·1 to 20·3, and 0 to 16·2 per cent. Root rot of seedlings after seed treatment with 20 per cent. copper trichlorophenolate ranged from 0 to 1·1 as against 2·9 to 16·3 per cent. for the untreated in 1953 and from 0·1 to 13·2 as against 1·6 to 33·8 per cent., respectively, in 1954. The treatment did not affect the sowing quality of the seed.

Spielrein (R. E.) & Brady (C. J.). **A comparison of resistance to fungal attack of various fibres.**—*Aust. J. appl. Sci.*, 5, 4, pp. 418–427, 1 pl., 2 figs., 4 graphs, 1954.

At the Plant Fibre Section, Commonwealth Scientific and Industrial Research Organization, Melbourne, yarns of retted and decorticated flax and *Hibiscus cannabinus* and of retted jute and *Urena lobata* were subjected to burial in garden loam soil maintained at 65 to 70 per cent. water saturation and a temperature of 70° F. for varying periods up to 14 days, and to incubation with *Chaetomium globosum* [*R.A.M.*, 32, p. 94 *et passim*] and *Aspergillus niger*.

The results of periodical tests for residual tensile strength demonstrated high average rates of loss for all types of yarn, flax being the most and jute the least susceptible to soil burial. Jute was also the most resistant to decomposition by *C. globosum* and flax the least so, while *H. cannabinus* and *U. lobata* were approximately equal in this respect. Thus, the residual strengths of retted and decorticated flax after six days' burial were 10·3 and 18·1 per cent., respectively, compared with 53·4 per cent. for jute, the corresponding figures after four days' incubation with *C. globosum* being 19·2, 23·5, and 46, respectively. After a fortnight of soil burial all the yarns had lost most of their strength, jute retaining a little more than the others. Beyond the four-day incubation period with *C. globosum* loss of strength decreased sharply and differences between the several types become unimportant.

A. niger reduced the strength only of the two flax yarns and *U. lobata*. The fungus is non-cellulolytic, so that its effect must have been due to attack on some constituent other than cellulose. These yarns and decorticated *H. cannabinus* supported heavier fungal growth than those of retted *H. cannabinus* and jute.

The desirability of rot-proofing any of these yarns liable to exposure to weathering or soil contact is apparent.

Gould (C. J.). **Control of Sclerotium rolfsii in Iris bulbs.**—*Phytopathology*, 44, 12, pp. 711–713, 1954.

Although generally more serious in warmer areas, such as North Carolina [*R.A.M.*, 32, p. 433], *Sclerotium rolfsii* causes considerable damage to bulbous iris in western Washington in some years, especially when rains keep the ground moist in July or August and soil temperatures are high. In experimental tests from 1945 to 1949, and in commercial trials with the Wedgwood variety during 1949–50, practical control of the crown rot caused by the fungus was given by three hours' immersion of the bulbs in a warm (110° F.) solution of 0·5 per cent. formalin. A dip three hours later in a suspension of tersan (1 lb. in 8 gals. water) was effective in increasing yields. The fungicidal treatment should be supplemented by sanitary practices, such as adequate crop rotation, rejection of diseased planting material, and use of well-drained sites.

Weber (F.). **Virus-Kristalle in Lilium.** [Virus crystals in *Lilium*.]—*Protoplasma*, 44, 3, pp. 373–375, 1 fig., 1955.

At the Institute for Plant Physiology, Graz, Austria, virus crystals of variable form have been detected in the cytoplasm of *Lilium henryi* [cf. *R.A.M.*, 33, p. 702]. They predominate in the epidermis of the maturing pericarp, but occur also in the stem and more rarely in the leaves. Smaller and less well-defined crystals were further observed in the epidermis of the pericarp of *L. sutchuenense*.

Sironval (C.). **Un exemple de lutte physiologique contre l'infection.** [An example of physiological control of infection.] *-Lejeunia*, 15, pp. 51–54, 1951 (ex *Arch. Inst. Bot., Univ. Liège*, 22, 1952–3). [Received May, 1955.]

Studies at the Botanical Institute, University of Liège, Belgium, on 'toile' disease [*Botrytis cinerea*: *R.A.M.*, 25, p. 262] of *Begonia semperflorens*, which destroys entire plantings at the cotyledonary stage in a few hours, showed that long periods of daylight favour growth and increase the resistance of the seedlings, grown from seed sown between the end of December and the end of January, to the disease. The fungus destroys the main root of many of the plants whatever the amount of daylight. Subsequently, if daylight is brief, it rapidly spreads along the hypocotyl and invades the cotyledons, which collapse on to the damp soil. This process continues for a few days, the seedlings dying off one after another. When, however, the days are long, the destruction of the main root is accompanied by a rapid and extensive formation of adventitious roots. The plants remain upright and the spread of infection is greatly retarded, the presence of numerous roots making the soil relatively dry and allowing the seedlings to develop satisfactorily. It is concluded that the usual control methods should be supplemented by additional artificial 'daylight' in greenhouses.

Brierley (P.). **Symptoms in the florists' Hydrangea caused by Tomato ringspot virus and an unidentified sap-transmissible virus.** *-Phytopathology*, 44, 12, pp. 696–699, 1 fig., 1954.

This is an amplified description of studies at the U.S. Plant Industry Station, Beltsville, Maryland, on tomato ring spot virus in *Hydrangea macrophylla* in Maryland, North Carolina, and Pennsylvania, a preliminary note on which has

already appeared [*R.A.M.*, 33, p. 231]. The most characteristic symptom was a dull yellow foliar chlorosis with superimposed diffuse, green blotches. Diseased plants were dwarfed, with irregularly shaped leaves and small, pale flowers; they were unmarketable, but the incidence of infection was generally low. The following species reacted to inoculation with the virus from *H. macrophylla* by the development of systemic symptoms: *Antirrhinum majus*, aster, cucumber, *Helichrysum bracteatum*, tomato, tobacco, *Petunia hybrida*, *Phlox drummondii*, *Platycodon grandiflorum*, cineraria, *Verbesina encelioides*, and *Zinnia elegans*. *Eschscholtzia californica*, *Gilia capitata*, gloxinia, spinach, and *Tropaeolum majus* were symptomless carriers of the virus, which was reisolated from them. Local lesions were formed on *Datura stramonium*, *Tetragonia expansa*, and *Silene compacta*, but the virus could not be recovered in tobacco on subinoculation. The typical symptoms of tomato ring spot developed in Strafford hydrangeas eight months after graft inoculation and 14 to 20 after sap inoculation.

Chlorotic and brown rings and vein patterns caused by an unidentified virus, or possibly more than one, sap-transmissible to the same host but non-infectious to tobacco, are prevalent in hydrangeas.

Brierley (P.). **Symptoms induced in Chrysanthemums on inoculation with the viruses of mosaics, aspermy, and flower distortion.**—*Phytopathology*, 45, 1, pp. 2–7, 1 fig., 1955.

At the Horticultural Crops Research Branch, United States Department of Agriculture, Beltsville, Maryland, the Friendly Rival, Good News, and Monument chrysanthemum varieties were graft-inoculated with the viruses of mosaics and tomato aspermy [*R.A.M.*, 31, p. 284], singly and combined, and then flowered twice. In a second experiment Friendly Rival was inoculated with the same viruses and a newly recognized flower distortion virus, probably the one responsible for severe infection of the host in Europe [32, p. 483].

In ray florets the mosaic viruses B and Q [32, p. 679] induced a brown streaking differing in intensity with the variety and virulence of the particular strain used. Tomato aspermy virus proved difficult to establish systemically and seldom caused foliar symptoms, though it sometimes gave rise to slight dwarfing of the blooms accompanied by waving and curling of the ray florets. The flower distortion virus, detected alone in White Wonder and associated with the mosaic and tomato aspermy viruses in Yellow Spoon, caused severe floral stunting in Friendly Rival in four months and in Good News and Monument in eight to nine. The ray florets were short, narrow, incurved, or irregularly curled.

Winstead (N. N.) & Haasis (F. A.). **A flower blight of Camellias in North Carolina incited by Sclerotinia sclerotiorum.**—*Phytopathology*, 44, 12, pp. 717–718, 1954.

In a comparative study at the North Carolina Agricultural Experiment Station of the camellia flower blights incited by *Sclerotinia sclerotiorum* and *S. camelliae* [*R.A.M.*, 34, p. 36], the former isolated from naturally infected flowers of the Candidissima, Duchess of Sutherland, Flame, Herme, Orton Pink, and Pink Perfection varieties, the advanced (as opposed to the early) symptoms on inoculated plants were generally distinguishable. For instance, in the later stages of the disease, mycelium and sclerotia were uniformly prominent on the surface of necrotic petals inoculated with *S. sclerotiorum* and maintained under very humid conditions, whilst black, wet masses of microconidia were frequently observed under the same conditions on flowers infected by *S. camelliae*, but no mycelium or sclerotia. The petals of blossoms invaded by *S. camelliae* presented a network of dark brown veins which was usually absent or less marked with *S. sclerotiorum*.

The two fungi were readily differentiable in culture. Young cultures of *S. sclerotiorum* were white with profuse aerial mycelium, whereas those of *S.*

camelliae were greyish-white with scanty mycelial growth. *S. sclerotiorum* rapidly produced numerous sclerotia on potato dextrose agar compared with only a few after 10 to 14 days for *S. camelliae*. On the other hand, the latter species gave rise to numerous microconidia aggregated in dark, beady, viscous droplets, while these spores were only sparsely produced by *S. sclerotiorum*.

In the field the sclerotia of *S. camelliae* were recognizable by their petalloid form and very large size compared with the small, rounded or elongated ones of *S. sclerotiorum*. The apothecia of *S. camelliae* tended to be rather darker, larger, and more numerous (up to 45 per sclerotium) than those of *S. sclerotiorum*.

THOMAS (W. D.). **The reaction of several Carnation varieties to bacterial wilt.**—*Phytopathology*, 44, 12, pp. 713–715, 1954.

Of five carnation varieties tested at the Colorado Agricultural and Mechanical College for their reactions to *Pseudomonas caryophylli* [*R.A.M.*, 33, p. 723], Durango appeared to be immune and without any tendency to carry the pathogen in a masked form. White Sim and Skyline were semi-resistant and might serve as carriers of the bacterium, while Arapahoe and Miller's Yellow were susceptible and could not be considered as symptomless carriers.

RAABE (R. D.) & HANSEN (H. N.). **Entomosporium leaf spot of Rhaphiolepis.**—*Phytopathology*, 45, 1, p. 55, 1 fig., 1955.

In the spring of 1954 Indian hawthorn (*Rhaphiolepis* [*Raphiolepis*] *indica*) in several nurseries in the San Francisco Bay area of California was severely attacked and sometimes defoliated by *Fabraea maculata*, which produced on both leaf surfaces circular, slightly raised, grey or tan-coloured spots, 1 to 8 mm. in diameter, coalescing when numerous and frequently surrounded by a brown or purple halo. Chlorosis sometimes developed on the upper side. Inoculation experiments with spores from the diseased leaves gave positive results on *R. indica*, its var. *rosea*, and *R. ovata*, the last-named, however, being much more resistant than the other two hosts. This is believed to be the first record of *F. maculata* on *R. indica* in the United States and of its occurrence anywhere on *R. ovata*.

BUTLER (F. C.). **Plant diseases. Anthracnose and sooty blotch of Red Clover. Two diseases new to New South Wales.**—*Agric. Gaz. N.S.W.*, 64, 7, pp. 368–370, 386, 4 figs., 1953.

Red clover anthracnose (*Colletotrichum trifolii*) in New South Wales [*R.A.M.*, 34, p. 284] is carried over from season to season on diseased clover fragments mixed with seed samples and on plant debris in the soil. The host range includes many species of *Trifolium* and *Medicago* and other related forage and manure plants, but the fungus has not been observed on white clover. Breeding for resistance appears to be the most promising means of control.

A disease of minor economic importance is sooty blotch (*Cymadothea trifolii*) [34, p. 285], found on red clover at Guyra in April, 1953. If heavy infection occurs, the hay should be cut and removed; otherwise there is no necessity for special control measures.

HELD (V. M.). **Physiological differences between a normal and a degenerate strain of Sclerotinia trifoliorum.**—*Phytopathology*, 45, 1, pp. 39–42, 1955.

At the United States Regional Pasture Research Laboratory, State College, Pennsylvania, the nutrition and protopectinase and toxin secretions of a normal and a degenerate strain of *Sclerotinia trifoliorum*, the agent of a destructive clover rot [*R.A.M.*, 13, p. 240; 32, p. 22 *et passim*], were studied to determine possible

differences between them which might elucidate host susceptibility relationship. Significant disparities in the effect on the growth of the two strains, measured by the dry weight of the mycelial mats, were observed among the 27 sources of nitrogen and various B-vitamins used singly and in combination. Biotin accelerated the initial growth of both strains, but thiamine-hydrochloride and inositol did not. The maximum mycelial weights of 38 and 29 mg. for the normal and degenerate strains, respectively, were attained with casein hydrolysate as a source of nitrogen, while other good sources included phenylalanine, DL-alanine, L-leucine, and D-arginine-hydrochloride; neither isolate made any growth in the absence of nitrogen or with 3,5 diiodotyrosine as its source, while sodium nitrate, DL-lysine-hydrochloride, and urea permitted only very scanty development (1 and 1, 2 and 2, and 2 and 2, respectively) [cf. 17, p. 252], as also did a number of other compounds.

The degenerate strain secreted considerably more protopectinase than the normal in a synthetic medium containing D-glucose or sodium polypectate as the carbon source. The normal strain secreted a toxin (absent from the degenerate isolate) that induced wilting of Ladino clover leaves within 45 minutes under conditions promoting rapid transpiration, e.g., in bright sunlight at 20° to 26° C. The substance withstood 10 minutes' heating at 100°.

Erwin (D. C.). **Root rot of Alfalfa caused by Phytophthora cryptogea.**—*Phytopathology*, 44, 12, pp. 700–704, 2 figs., 1 graph, 1954.

The species of *Phytophthora* responsible for root rot of lucerne in five counties of California, a preliminary note on which has already appeared [*R.A.M.*, 33, p. 358], is characterized by an originally non-septate, later septate mycelium, 7 to 8 μ in diameter, forming on water and potato dextrose agars a profusion of intercalary and terminal hyphal swellings, the dense contents of which imparted a tan coloration to older cultures. Non-papillate, ovoid to ellipsoid sporangia, 27 to 63 by 23 to 38 (average 39 by 31) μ developed sparsely, usually after 8 to 12 days, on a sterilized medium of four hemp seeds in 15 ml. water and on water agar in which lucerne seeds were allowed to germinate. Globose oogonia, 23 to 39 (31) μ in diameter, were produced more abundantly than the sporangia on the same media and scantily in four- to six-week-old cultures on Lima bean, tomato juice, and potato dextrose agars. The antheridia were amphigynous and the smooth globose oospores ranged from 19 to 37 (25) μ in diameter. The minimum, optimum, and maximum temperatures for growth were 8°, 25°, and 30° to 33° C., respectively. On the basis of these characters the pathogen is identified as *P. cryptogea*.

Hashioka (Y.), Ikegami (H.), & Siraki (S.). **Fungicidal control of Sclerotinia rot of Chinese Milk Vetch, with special reference to the seed dressing.**—*Mem. Fac. Agric. Gifu Univ.*, 5, pp. 21–30, 1 pl., 1955.

In experiments at Gifu University, Japan, the emergence of apothecia of *Sclerotinia trifoliorum* [*R.A.M.*, 33, p. 300] was prevented by heavily dressing Chinese milk vetch [*Astragalus sinicus*] seed-sclerotia mixtures with fungicidal dusts at concentrations of 1 to 1·5 per cent. by weight of the mixtures. Arasan and fernasan, each containing 50 per cent. of thiram, and pomarsol forte (80 per cent.), especially the last, proved most effective, an organic mercury dust being somewhat less so and zineb, copper dusts, and dichlone unsuitable for the purpose in view. When the thirams and mercury dust were applied to emerged apothecia, the latter were killed or inactivated. Heavy dusting with slaked lime (2 kg. per are) also caused shrivelling of the apothecia. Primary infection by ascospores on the foliage of *A. sinicus* is also preventable by dusting with the thirams or mercury, but secondary development of the rot associated with hyphal extension cannot be controlled by this method.

Progress Report of the Forage Crops Division, Forage Crops Laboratory, Saskatoon, Saskatchewan, 1949–1953. –43 pp., 11 figs., 1954. [Received 1955.]

In the section on investigations with lucerne by J. L. Bolton (pp. 7–18) an account is given of the breeding project for resistance to bacterial wilt [*Corynebacterium insidiosum*: *R.A.M.*, 34, p. 155], initiated in 1946 in co-operation with the Experimental Station and Plant Pathology Laboratory, Lethbridge, Alberta. Seedlings to be tested are dipped in a suspension of the bacterium before being transplanted to wilt-infested soil in the nursery and, when well established and then at yearly intervals, are needle-inoculated below the crown. Susceptible types can be distinguished after two or more growing seasons. All selections are made on a disease-free basis. Recently, a satisfactory greenhouse technique for testing resistance has been developed. Seedlings are planted in 5 to 6 in. pots, 20 to 30 per pot, and two months later the mass of roots and soil is cut transversely half-way down the pot, the inoculum applied to the cut surfaces and the two sections returned to their original position. Wilt symptoms are assessed after another four months.

The results of intercrossing and outcrossing selected plants suggest that resistance is a dominant factor. Using a rigorous screening technique high resistance could be obtained in a progeny even though one parent was susceptible. About 200 parents produced progenies with resistance equal to or better than that of Ranger. The results of the screening tests suggest that some progenies from plants selected for resistance to winter crown rot [caused by a basidiomycete: 33, p. 430] will be highly resistant to wilt.

Leaf and stem diseases are reported to be widespread in the northern districts of the Prairie Provinces, losses being very serious or complete in fields where a seed crop is harvested. The most important disease is black stem [*Ascochyta imperfecta*: 33, p. 358]; yellow leaf blotch [*Pseudopeziza jonesii*: cf. 29, p. 311] may be prevalent in certain fields and leaf spot [*P. medicaginis*: 29, pp. 143, 214] is relatively insignificant.

Progress Report of the Forage Crops Division, Central Experimental Farm, Ottawa, Ontario, 1949–1953.—61 pp., 7 figs., 1955.

In the section of this report dealing with grass breeding investigations, by R. M. MacVicar and W. R. Childers (pp. 21–25), it is stated that *Festuca elatior*, of considerable economic importance in Canada, is highly susceptible to crown rust (*Puccinia coronata*) [*R.A.M.*, 26, p. 202] and infection may affect the palatability of the grass. Of many thousands of plants which have been screened and tested during the past few years seven appear to carry some degree of resistance.

Selection, cloning, and field testing have yielded twelve *F. rubra* plants with superior turf-forming ability and resistance to leaf spot (*Helminthosporium dictyoides*) [cf. 31, p. 422]. In the laboratory sporulation was induced by exposing cultures to ultra-violet rays. A satisfactory suspension was obtained by mixing the culture with sterile water in a blender and characteristic brown lesions developed when it was sprayed on plant material in a moist chamber. This method is therefore being used in screening selected material.

In midsummer the yield and palatability of *Dactylis glomerata* are seriously affected by *Rhynchosporium secalis* [24, p. 177] and *Scolecotrichum graminis* [21, p. 129]. Leafy, late-flowering types showing some resistance have been selected.

Brown stripe (*S. graminis*) occurs every year in epiphytotic proportions on timothy (*Phleum pratense*). In the greenhouse considerable blight developed a month after interspersing 70 heavily infected plants among a group of nine-week-old seedlings and in a further three weeks most of the seedlings showed symptoms. Only seven plants out of 1,788 showed any degree of resistance.

H. A. McLennan, reporting on legume breeding investigations (pp. 28–30),

states that since 1948 the main red clover breeding programme has been concerned with the production of a variety of double-cut red clover resistant to crown rot (*Sclerotinia trifoliorum*) [29, p. 214], which reduces stands considerably in weather conditions favourable to the disease, particularly on land repeatedly planted to legumes. Resistant plants are selected by heavily infecting three-month-old seedlings; the resistant survivors are crossed and the seedling progenies reinoculated. A 90 per cent. kill is obtained all through the year in eight to ten days in a controlled temperature chamber. Some sign of improved resistance was observed in the second and third generation progenies of selected plants.

YAMADA (S.). **The new trials of the chemical control of the fruit tree diseases.**—*Agric. & Hort.*, 30, 2, pp. 291–296, 1955. [Japanese.]

The value of eradicant fungicidal treatments during the winter is emphasized. Spraying with 0·5 per cent. sodium pentachlorophenate mixed with lime-sulphur during dormancy has been found effective in the control of *Alternaria kikuchiana* [*R.A.M.*, 32, p. 436 and next abstract] and *Venturia pirina* on pear, *Cladosporium* [*Fusicladium*] *carpophilum* on peach, and vine anthracnose (*Elsinoe ampelina*) [C.M.I. map No. 234] in Japan.

KAWAMURA (T.). **Application of the mercuric fungicides for the control of the fruit diseases.**—*Agric. & Hort.*, 30, pp. 189–192, 1954. [Japanese.]

Spraying with 1 in 500 to 1 in 2,000 uspulun from the pre-blossom to the adult green fruit stage is reported to be very effective in the control of black spot of Japanese pear (*Alternaria kikuchiana*) [see preceding abstract]. Although uspulun prevents sporulation and kills the spores at the time of application, its protective action does not persist as long as that of Bordeaux mixture. Spraying with 1 in 1,000 uspulun is also efficacious against peach leaf curl (*Taphrina deformans*) [C.M.I. map No. 192]. The application of ceresan-slaked lime (1 in 5) during dormancy as a possible means of control of chestnut blight is suggested by the results of a laboratory test on the gaseous action of ceresan against *Endothia parasitica* [No. 66].

GARMAN (P.), KEIRSTEAD (L. G.), & MATHIS (W. T.). **Quality of Apples as affected by sprays.**—*Bull. Conn. agric. Exp. Sta.* 576, 46 pp., 7 figs., 4 graphs, 1953. [Received 1955.]

From 1950 to 1952 taste and chemical determinations were made on apples [cf. *R.A.M.*, 34, p. 99] from sprayed plots at Poughkeepsie, New York, Waltham, Massachusetts, and Mount Carmel, Connecticut. The results demonstrated that some fungicides, notably crag 341 (glyodin), increased sugars markedly; a complete schedule of phygon-lead arsenate reduced the acid content and captan increased it slightly. Very significant preferences for thiram-sprayed fruit as compared with sulphur (in combination with lead arsenate and parathion) developed over the test period and were relatively consistent from year to year. Flavour tests demand complete examination of both processed and unprocessed, refrigerated and fresh fruit for general preference and for off-flavours. Selection of fruit on a maturity basis is also important and the trees should be in good condition.

HUTTON (K. E.). **Control of black spot of Apples and Pears.**—*Agric. Gaz. N.S.W.*, 65, 3, pp. 161–162, 1 fig., 1954.

Each year since 1949, 0·12 per cent. thiram [*R.A.M.*, 34, p. 303] has been compared with standard lime-sulphur for the control of black spot of apples (*Venturia inaequalis*) and pears [*V. pirina*] in New South Wales [30, p. 168]. From these experiments and field observations thiram appears to give an equal degree of control on the fruit but is less effective against leaf infection. Its advantages over

lime-sulphur are that it is non-injurious to leaves and to the tree as a whole, the fruit being larger with no russeting [33, pp. 94, 375]; it is harmless to all pear varieties at all stages; and is compatible with most common insecticides. Disadvantages are that it is more expensive (20*s.* 5*d.* for 1½ lb. in 100 gal. spray against 11*s.* 3*d.* for 1–40 lime-sulphur); does not suppress the acarina population; offers little control of apple powdery mildew [*Podosphaera leucotricha*]; may cause slight skin burning on the operator; thins the Granny Smith apple crop slightly; and is incompatible with copper sprays.

After a consideration of these points, thiram is recommended for both apples and pears, mainly as an alternative to lime-sulphur and possibly to Bordeaux mixture with some pear varieties.

Fulkerson (J. F.). **The relation of light to the production of pycnidia by Physalospora obtusa.** —*Phytopathology*, 45, 1, pp. 22–25, 1 fig., 1955.

At the North Carolina State College potato dextrose agar cultures of *Physalospora obtusa*, the agent of apple black rot and leaf spot, did not normally produce pycnidia in the absence of light [cf. *R.A.M.*, 17, p. 46; 30, p. 475], but their development by monoconidial and monoascospore isolates was stimulated by irradiation with fluorescent light for 12 to 18 hours at an intensity of approximately 200 foot-candles or for 100 hours at 20. The blue range of the visible spectrum appeared to be the most effective, followed by the green or white, while very few pycnidia were formed under yellow and none under red light. The process did not seem to be affected by ultra-violet radiations. Pycnidial production was confined to areas of the cultures exposed to direct or indirect irradiation. Under continuous irradiation at sufficient intensities pycnidia developed in cultures maintained at 10° but not at 5° C.

Togliani (F.). **Una maculatura parassitaria dei frutti pendenti di Melo della varietà 'Calville Bianca' causata da Phoma rubefaciens n. sp. (p. t.).** [A parasitic spotting of hanging Apple fruits of the variety 'Calville Bianca' caused by *Phoma rubefaciens* n. sp. (pro tem.).] —*Ann. Sper. agr.*, N.S., 7, 5, pp. 1621–1628, 5 figs., 1953. [English summary.]

In November, 1951, Calville Bianca apples still attached to the trees, at Viserba (Forlì), Italy, bore a depressed, firm, bright sealing-wax red, later much darker spot about 11 mm. long by 5 mm. wide near the calyx depression and running along a rib. The lesion, not more than 4 mm. deep, was delimited by a continuous, raised black border, while at the centre there were numerous black pycnidia.

From the affected area a fungus was isolated which on the host gave rise to spherical-depressed, mostly isolated pycnidia 180 to 210 μ in diameter; in culture on various media the pycnidia were spherical or slightly cylindrical and 190 to 230 μ. The hyaline phialides were 8 to 20 (average 14) μ long. The very numerous, hyaline, unicellular, pseudocylindrical, sometimes slightly curved conidia were flattened at the extremities and measured 3·8 to 4 by 1·8 to 2·3 μ in culture and 4·2 to 5·1 by 2 to 2·9 μ on the host. The fungus is named *Phoma rubefaciens* n.sp.

Togliani (F.) & Filocamo (E. F.). **Osservazioni su di un caso di 'mal del piombo' parassitario del Melo.** [Observations on a case of parasitic 'silver leaf' disease of Apple.]—*Ann. Sper. agr.*, N.S., 7, 5, pp. 1629–1638, 3 figs., 8 graphs, 1953. [English summary.]

A strain of *Stereum purpureum* isolated from apple trees [cf. *R.A.M.*, 24, p. 153; 31, p. 287, *et passim*] grafted three years before and growing at Carpi, Modena, Italy, near infected poplars, was found to be identical in culture, except for a few minor differences, with a strain from peaches [33, p. 733]. The epidemiological features of the two outbreaks, however, varied. The fungus had clearly entered the

apple trees through grafting wounds, the mycelium was easily found in all parts of the tree showing symptoms, and foci of infection were abundant on the trees and in the vicinity of the orchard. In the case of the outbreak on peach the situation in all these respects was entirely different [32, p. 570]. It is concluded that further studies should be carried out on the etiology and epidemiology of the disease in peach trees.

Govi (G.) & Di Caro (S.). **L'Ophiostoma persicinum n. sp. isolato da radici di Pesco.** [*Ophiostoma persicinum* n. sp. isolated from Peach roots.]—*Ann. Sper. agr.*, N.S., 7, 5, pp. 1639–1645, 3 figs., 1953. [English summary.]

Ophiostoma persicinum n.sp., isolated from roots of mature peach trees affected by a severe form of 'silver leaf' disease [see preceding abstract] near Ravenna, Italy, produced in culture on potato dextrose agar hyaline, sparsely septate hyphae 1·7 to 2·3 μ in diameter. In adult colonies very dark brown hyphae developed, 2·3 to 4·8 μ wide and frequently septate. The hyaline, pyriform-elongated *Cephalosporium* conidia measured 1·5 to 2 by 3 to 6 μ. The perithecia, superficial or slightly immersed in the substratum, were 75 to 190 (average 120) μ in diameter and had a beak 275 to over 1,000 (average 600) μ long by 27 μ wide at the base, narrowing to 10 μ, with a crown of hyaline cilia at the apex. The hyaline, curved ascospores measured 2·3 to 4 by 1·6 μ.

Togliani (F.). **Sulle cause della variazione del colore nelle foglie di Pesco colpito dal 'mal del piombo' ad apparizione estiva.** [On the causes of the variation in the colour of the leaves of Peach affected by 'silver leaf disease' appearing in summer.]—*Ann. Sper. agr.*, N.S., 7, 5, pp. 1647–1650, 1 fig., 1953. [English summary.]

The author adduces evidence in support of the view expressed by Osterwalder (*Schweiz. Z. Obst.-u. Weinb.*, 61, 3, pp. 43-45, 1952) that the silver-blue colour of the leaves of peach trees attacked by the physiological form of silver leaf disease occurring in summer [cf. *R.A.M.*, 33, p. 733] is caused by the presence of calcium oxalate crystals in the epidermal cells [cf. 13, p. 385]. In his opinion, however, it could also be caused by an abnormal refractive index of the cell plasma; in this case the calcium oxalate crystals would be the only symptom of the condition, but not the main cause of the silver-blue colour.

Hervert (V.). Новые данные по биологии мучнистой росы Яблони и их практическое использование. [New data on Apple powdery mildew and their practical application.]—За Соц Сельскохоз Науку Сер. A [*Socialist. agric. Sci., Czechoslovakia*, Ser. A], 3, 4, pp. 333–350, 10 figs., 2 graphs, 1954. [German summary.]

Observations were carried out in Prague, Czechoslovakia, on biological and morphological development of *Podosphaera leucotricha* [*R.A.M.*, 32, p. 173] which has become one of the most serious apple diseases in the country in recent years. The influence of external conditions on the formation and maturation of perithecia was found to be of greater importance than has hitherto been acknowledged. In studying the cycle of development from the first appearance of the fruiting bodies in 1952 through to the spring of 1953, it was established that perithecia which have not matured in the autumn cannot complete their development in the spring. No asci or ascospores are formed and the immature fruiting bodies die off during the first onset of dry spring weather [cf. 34, p. 159]

Susceptibility was found to vary with the different parts of the plant, being influenced by the developmental stage of the host and the biochemical properties of different parts of the tree. Vertical shoots appear to be more susceptible than

the horizontal ones and younger, opening leaves than older ones, which sometimes bear only local infection. K. Cejp has stated (*Věda přírodní*, 19, p. 1, 1938–9) that of the older leaves, only those in the shade growing in diffuse light become infected, because of the delay in development.

Eradicant spraying with various fungicides at concentrations known to be lethal to the fungus did not significantly reduce infection, and it appears that mycelium overwintering on the surface of the branches and annual shoots is not of primary importance in the spring infection. Also the cutting of infected shoots does not contribute greatly, as previously thought, in the control of the disease, and may, indeed, make it worse as the new growth is exposed to secondary infection. Overwintering of the mycelium in the buds, however, is of great importance [*R.A.M.*, 32, p. 260], serving as the main source of spring infection. The exact period when the hyphae penetrate the bud is still uncertain.

It is suggested that *Cicinnobolus* sp., parasitic on *P. leucotricha*, may be of great value in control under certain conditions.

Lušin (V[era]), Panjan (M.), & Regan-Mastnak (A.). **Kemijske metode za određivanje virusnih bolesti koštićavog voća.** [Chemical methods for identifying virus diseases of stone fruits.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1954*, 22, pp. 6–17, 2 graphs, 1954. [English summary.]

Experiments carried out in 1952 and 1953 at the Institute for Plant Protection, Zagreb, Yugoslavia, to determine whether chemical methods might be used for identifying [unspecified] virus diseases in stone fruits in Yugoslavia, showed that the whole leaf-staining method [*R.A.M.*, 29, p. 602] was the most suitable, while that using alcohol and hydrochloric acid was the most sensitive and gave a positive reaction even with a very small content of phenol, though the increased phenol was not always due to virus. None of the methods tested was satisfactory for *Prunus* virus 7 [plum pox: 33, p. 734 and next abstract].

Stančević (A.) & Pavićević (B.). **Intenzitet napada šarke na razne sorte Šljiva u rejonu Toplice.** [The intensity of attack of Plum pox disease on different Plum varieties in the region of Toplica.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1954*, 22, pp. 38–46, 1954. [English summary.]

Investigations conducted by the Institute for Fruit Cultivation, Čačak, Yugoslavia, indicate that plum pox disease due to *Prunus* virus 7 [see preceding abstract] is also present in Bosnia, Hercegovina, and Montenegro.

None of the plum varieties grown in the region of Toplica, Serbia, is resistant, but a poor quality Dzhenerika grown in this region showed some resistance and selected types of it are recommended for cultivation on poorer soils where other fruit cannot grow.

Hildebrand (E. M.). **Yellow-red or X-disease of Peach.**—*Mem. Cornell agric. Exp. Sta.* 323, 54 pp., 23 figs., 1 map, 1953.

This report covers the results of investigations into the X-disease of peaches carried out between 1938 and 1944 at Cornell University Agricultural Experiment Station. Artificial inoculation of peach seedlings, using budwood from greenhouse seedlings showing advanced chlorosis or orchard trees with leafspots and lacerations, produced typical X-disease symptoms within one month. Natural transmission of eastern X-disease occurs between peach and chokecherry only from the middle of June to the middle of July. Comparative studies of eastern and western X-disease and eight other peach virus diseases show that there are significant differences between them. The best control of eastern X-disease is obtained by the eradication of the chokecherry (*Prunus virginiana*). The virus is inactivated in budwood by exposure for six to seven minutes in water at 50° C.

Gjaerum (H. B.). **Kirsebærheksekost og sortresistens.** [Cherry witches' broom and varietal resistance.]—*Frukt og Bær, 1954*, pp. 69–72, 3 figs., 1954.

In 1952 and 1953 the author examined a total of 1,232 sweet cherry trees comprising 38 varieties in the Ullensvang and Kinsarvik districts of Norway for their reactions to *Taphrina cerasi* [C.M.I. map No. 199]. Among the most resistant (0 to 11·4 per cent. infection) were Coe's Transparent, Dønnisen's Yellow, Emperor Francis, White Spanish, Rivers Early, Small Elton, Svenskar, and Tolleivsbaer, compared with Elton, Früheste der Mark, Hedelfinger, Holmabaer, Kassin's and Knight's Hjerte, Osabaer, and Werderske, which were highly susceptible (31·4 to 100 per cent.).

Bremer (H.). **Wirkung eines Blattfleckenpilzes auf die Konstitution von Baumkronen.** [Effect of a leaf spot fungus on the constitution of tree crowns.]—*Sydowia*, 8, 1–6, pp. 275–277, 1 graph, 1954.

Further investigations on the association between increased transpiration and defoliation of the crowns of almond trees attacked by *Clasterosporium carpophilum* in the Ankara district of Turkey [*R.A.M.*, 27, p. 350] are reported. The intensity of transpiration was found to be approximately equal in spotted and healthy leaves from the same severely diseased tree, whereas in those from mildly infected neighbouring trees the rate was up to 62·5 per cent. slower after half-an-hour. There are two possible explanations of the phenomenon: either the fungus enhances transpiration, not only in the infected leaves but throughout the crown, or it establishes itself more readily on trees with freely transpiring foliage. The former hypothesis is regarded as the more plausible of the two.

Di Caro (S.). **Azione antisettica del sale sodico dell'acido deidroacetico (DHA-S).** [Antiseptic action of the sodium salt of dehydroacetic acid (DHA–S).]—*Ann. Sper. agr.*, N.S., 7, 5, pp. 1651–1657, 1 graph, 1953. [English summary.]

In preliminary tests carried out at the Experimental Laboratory of Plant Pathology, Bologna, Italy, the growth of *Monilia* [*Sclerotinia*] *laxa*, *Botrytis cinerea*, *Penicillium* sp., *Fusarium avenaceum*, and *Rhizopus nigricans* [*R. stolonifer*] at 25° C. on malt agar containing 0·5 per cent. of the sodium salt of dehydroacetic acid (DHA–S) [*R.A.M.*, 30, p. 183] was, respectively, 6, 2, 6, 8, and 8 per cent. of that on a medium without DHA–S. Germination of *S. laxa* conidia in hanging-drop culture was reduced from 90 per cent. in distilled water to 5 per cent. by the salt at the same concentration.

Washed cherries were immersed in 0·5 per cent. DHA–S, wounded with a flamed needle, and after one to two minutes removed and sprayed with conidial suspensions of the various organisms. An untreated lot similarly inoculated became heavily infected, especially by *R. stolonifer*, which caused severe rotting in five or six days at 18° to 22°. The treated fruit remained in good condition until the eighth day, when slight rotting was present, mostly at the site of the wounds; rotting did not become general until the 15th day, and appeared to be mainly due to lack of air in the containers and gradual loss of resistance to fungal penetration by the tissues.

Vaughan (E. K.). **Three unusual manifestations of cane gall on cultivated Blackberry.**—*Phytopathology*, 45, 1, pp. 56–58, 1 fig., 1955.

At Oregon State College, Corvallis, cane gall (*Agrobacterium* [*Bacterium*] *rubi*) [*R.A.M.*, 30, p. 209] assumed three unusual forms in 1952 and 1953: an irregular shape at the base of Himalaya blackberry [*Rubus procerus*], roughly spherical galls, 1½ to 3 in. in diameter, on boysenberry, and natural infection of the foliage and flowers of nectarberry [? *R. ursinus* var. *nectar*].

On *R. procerus* the galls, which closely resembled those depicted by Bennett in

Michigan on black raspberry [*R. occidentalis*: 7, p. 793], caused such heavy losses that the fruit in many fields was not harvested. The general appearance of the excrescences on boysenberry was much more like crown gall (*A.* [*B.*] *tumefaciens*) than ordinary cane gall. The yield and quality of the fruit were appreciably impaired. Galls developed not only on the canes of nectarberry but also on all parts of the fruit spurs, bacteria being isolated from outgrowths on the petioles, leaves, pedicels, and flowers. This is the first occasion on which natural foliar and floral infection of *Rubus* has been observed by the author in Oregon. The disease necessitated the abandonment of much of the planting.

In comparative physiological studies the bacteria isolated from the several types of gall were indistinguishable and the morphological differences are attributed to environmental factors rather than genetic or other variations in the causal organism.

Maramorosch (K.). **Transmission of the Blueberry-stunt virus by Scaphytopius magdalensis.**—*J. econ. Ent.*, 48, 1, p. 106, 1955.

The results of small-scale experiments at the Rockefeller Institute for Medical Research, New York, demonstrated the implication of *Scaphytopius magdalensis* in blueberry-stunt virus [*R.A.M.*, 30, p. 422], whereas *S. verecundus* did not appear to be active in this respect. Similar observations were made by M. T. Hutchinson in New Jersey in more extensive tests forming part of an ecological study of the two leafhoppers (*J. econ. Ent.*, 48, pp. 1–8, 1955).

Flock (R. A.) & Wallace (J. M.). **Transmission of Fig mosaic by the eriophyid mite Aceria ficus.**—*Phytopathology*, 45, 1, pp. 52–54, 2 figs., 1955.

At the Citrus Experiment Station, Riverside, California, fig mosaic virus [*R.A.M.*, 13, p. 252] was found to be transmitted by the eriophyid mite *Aceria ficus*. Feeding by non-viruliferous individuals caused foliar distortion with slight chlorosis and russeting but did not induce typical mosaic symptoms. The latter are not only very erratic in occurrence, developing more consistently at 90° than at 80° F., but highly variable, ranging from faint, diffuse areas to clearly delimited lesions contrasting sharply with the leaf in colour. Using 200 mites per plant 100 per cent. transmission was obtained within 10 days. The disease was found to be present on every fig tree examined in the field in California.

Hartmann (H. J.) & Brown (J. G.). **The effect of certain mineral deficiencies on the growth, leaf appearance, and mineral content of young Olive trees.**—*Hilgardia*, 22, 3, pp. 119–130, 4 figs. 3 col., 4 graphs, 1953.

Mineral deficiency symptoms in young Mission olive trees were studied at the California Experiment Station, Davis. After two years of experiment potassium deficient trees were still normal in appearance, the only reaction being a general reduction in growth. This effect was more striking in trees deficient in nitrogen, phosphorus, and magnesium. In 1947 potassium deficiency symptoms in Butte County were characteristically light green leaf colour and necrotic areas at the tips or along the sides resembling boron deficiency [*R.A.M.*, 23, p. 69] but differing from it by a sharp demarcation between normal and necrotic tissues of the former contrasting with a transition from green through yellow to brown in the latter.

Nitrogen deficiency (0·9 to 1 as against the normal 1·2 to 2 per cent. of the dry weight) symptoms differed from those of potassium deficiency in that the leaves were shortened and curved along the midrib and no pronounced chlorotic leaf pattern or necrotic area developed. A marked shedding of the younger leaves was observed.

Phosphorus deficiency (0·03 to 0·05 as against 0·15 per cent.) was characterized

by a reduction in leaf size with partial defoliation, darkening of the green colour, and inhibition of new growth.

Magnesium deficiency (0·06 to 0·1 as against 0·15 to 0·2 per cent.) produced light-chlorotic areas from the tip to the base of the leaf and some shedding of leaves.

Experiments have further shown that low potassium value was obtained when either magnesium or calcium was high, and vice versa. Magnesium content was directly proportional to that of calcium. Withholding nitrogen in nutrient tests resulted in an increased phosphorus content but not the reverse.

FREIRE (J. R. J.). **A 'tuberculose' da Oliveira.** ['Tuberculosis' of the Olive.]—*Agros, Pôrto Alegre*, 6, 3, pp. 104–110, 1 fig., 1953. [English summary. Received April, 1955.]

Olive knot (*Pseudomonas savastanoi*) [C.M.I. map No. 135] was detected for the first time in Rio Grande do Sul, Brazil, in 1949 on cuttings imported from Portugal. It was subsequently observed on material from adult trees in Uruguayana and São Borja, Brazil, as well as on cuttings from Italy. A summary is given of the available information on various aspects of the disease and its control, based on 11 contributions to the literature.

FOGLIANI (G.). **Ricerche sulla leptonecrosi dell'Olivo. Nota III. Tentativi di riproduzione della malattia e ulteriori osservazioni sull'epidemia nell'anno 1951.** [Studies on leptonecrosis of the Olive tree. Note III. Attempts to reproduce the disease and further observations on the 1951 epidemic.]—*Ann. Sper. agr.*, N.S., 7, 4, pp. 1241–1258, 7 figs., 1953.

Further studies on olive leptonecrosis [*R.A.M.*, 34, p. 98] were concerned with attempts to transmit the disease. Of 32 combinations, mostly crown-grafts, made in 1951, 18 with healthy scions on diseased stocks and 14 with diseased scions on healthy stocks, only two healthy Favarolo shoots made a successful union with the diseased Leccino stock, and both gave rise to witches' brooms and oak leaf shaped leaves a year later. All the other grafts failed to take.

Replants from Tuscany established in 1951 developed advanced symptoms. In three- to 15-year-old plants there was extensive necrosis of the cambium and phloem, originating from external lesions. New growth produced towards autumn following a wet season was also partly diseased. Swellings developing on the side of the trunk or main branches corresponding to the affected leaves were an important diagnostic character, there being a direct relation between their number and the severity of disease.

TRIPATHI (R. D.). **'Bunchy top' and 'malformation' diseases of the Mango.**—*Indian J. Hort.*, 11, 4, pp. 122–124, 1 fig., 1954.

Two kinds of malformations in mango trees, termed 'bunchy top' [*R.A.M.*, 33, p. 542] for vegetative and 'malformation' for floral abnormalities, were investigated at the Fruit Research Station, Saharanpur, Uttar Pradesh. On the basis of correlation between the occurrence of the symptoms in the same tree they are considered to be expressions of the same disease which the author calls mango malformation. Varietal differences in susceptibility to bunchy top were observed, Bombay Yellow, Fajri Jafrani, and Bombay Green being equally susceptible while Safeda No. 1 is less so.

STOVER (R. H.) & WAITE (B. H.). **Colonization of Banana roots by Fusarium oxysporum f. cubense and other soil fungi.**—*Phytopathology*, 44, 12, pp. 689–693, 1954.

At the Tropical Research Department, United Fruit Company, La Lima, Honduras, the authors' improved Waring blendor method of isolating *Fusarium* spp.

from plant tissue [*R.A.M.*, 32, p. 634] was applied to studies on banana root colonization by *F. oxysporum* f. [var.] *cubense*. The fungus proved to be a weak saprophytic colonizer of buried Gros Michel roots, the predominant and primary organisms in most soils being *F. solani* and *Cephalosporium* spp., followed at a later stage by *Aspergillus fumigatus* and other *A.* spp. There were no consistently significant differences in the extent of colonization or duration of survival in colonized roots in untreated soils and those supplemented by 400 p.p.m. zinc sulphate, lithium chloride, magnesium sulphate, or borax. Less than 15 per cent. of the roots of plants found diseased in the field yielded *F.o.* var. *cubense*. The stele of the rhizome was the main focus of fungal activity following infection, few roots being invaded even in advanced stages of the wilt. Moreover, the pathogen did not readily penetrate healthy banana roots in the laboratory, nor was it uniformly recovered from the rhizosphere soil of infected field plants.

Merny (M.). **Recherche d'une technique de micro-essais de produits fongicides contre Cercospora musae à la Guadeloupe.** [A search for a method of making micro-tests of fungicidal products against *Cercospora musae* in Guadeloupe.] *J. Agric. trop. Bot. appl.* (formerly *Rev. int. Bot. appl.*), 1, 1–4, pp. 61–70, 3 figs., 2 graphs, 1954.

A rapid, inexpensive field test was devised in Guadeloupe for the preliminary selection of fungicides to control banana leaf spot (*Cercospora musae*) [*Mycosphaerella musicola*: *R.A.M.*, 29, p. 105] under conditions of natural infection. Four circles 16 cm. in diameter were marked out in a row on the under surface of the right-hand half of a newly opened leaf. Each of three of the areas was treated with a different material, applied with a scent spray, the materials tested being compared, two at a time, with copper oxychloride (50 per cent. copper) and the amount of infection expressed as a percentage of that in the fourth, untreated area. Each test comprised 12 leaves and included all possible arrangements in the position of the treatments on a leaf.

Of eight materials tested only zineb was more effective than copper oxychloride (9·37 per cent. infection compared with 16·22 per cent.), and this is to be used in subsequent large-scale field tests.

Critical analysis of the method showed that there was extreme variability in the results given by any one treatment. For example, the average amount of infection in the circles treated with copper oxychloride ranged from 1·5 to 55·2 per cent. Further, the degree of infection present in the untreated areas varied widely with the date of the experiment and tended to be greatest in the apical circle and lowest in the basal one.

In experiments at present in progress, 16 circles each 6 cm. in diameter, are arranged on a half leaf in four diamond-shaped groups of four. In this way, each of the four treatments is made on a single leaf in each of the same four positions as in the earlier experiments. The results (number of spots present 14 days after the appearance, in any circle, of the first) will be obtained on a date that varies for every leaf.

Frear (D. E. H.). **Pesticide handbook.**—196 pp., Pennsylvania State College, College Science Publishers, 1954. $1.25.

In the sixth annual revised edition of this handbook [cf. *R.A.M.*, 32, p. 685], which incorporates all the features of the previous editions, nearly 6,000 commercial pesticides are listed, together with information on their ingredients, uses, and manufacturers.

MARTIN (H.). **Guide to the chemicals used in crop protection. Second edition.**—295 pp., Ontario, Science Service, Dominion of Canada Department of Agriculture, 1953. $1. [Mimeographed.]

The second edition of this useful publication [cf. *R.A.M.*, 32, p. 685] contains a number of additions and alterations to the list of chemicals used for the protection of crops.

Förteckning över växtskyddsmedel som dem 1 december 1954 äro registrerade hos Statens växtskyddsanstalt. [List of plant protectives which are registered on 1st December, 1954, at the State Plant Protection Institute.]—*Växtskyddsnotiser, Stockh., 1954*, 5–6, pp. 65–82, 1954.

Alphabetical lists are furnished of (*a*) the plant protectives approved by the Swedish Plant Protection Institute, with notes on their several purposes, and (*b*) the firms supplying them.

SCHNICKER (J. L.). **Kemikaliekontrollen i finansåret 1953–54.** [Inspection of chemical substances in the financial year 1953–54.]—*Tidsskr. Planteavl*, 58, 3, pp. 511–538, 1955.

Information is presented on the various infringements of the Danish plant-protective and poison laws [see next abstract] detected in the course of the official analysis during 1953–4 of 576 samples [cf. *R.A.M.*, 25, p. 567; 31, p. 343], comprising, *inter alia*, 20 mercurials, 15 copper- and 16 sulphur-containing preparations, and three carbamates.

HAMMARLUND (L.). **Ny bekendtgørelse om bekæmpelsesmidler.** [New notification regarding plant protectives.]—Reprinted from *Gartnertidende, 1954*, 49, 2 pp., 1954.

Explanatory comments are given on certain sections of the new Danish order concerning plant protectives [cf. *R.A.M.*, 34, p. 161] issued by the Ministry of Agriculture in November, 1954, which are of particular interest to horticulturists. It includes the four categories of poisons, consumers' responsibility, special duties of employers, assistants' responsibility, and penalties [see preceding abstract]. Among other supplementary provisions may be mentioned the inclusion under the plant-protection laws of disinfectants for indoor plants, which were hitherto exempt.

VEENENBOS (J. A. J.). **Enkele problemen bij de zaadonsmetting met TMTD.** [Some problems of seed disinfection with TMTD.]—*Landbouwvoorlichting*, 12, 3, pp. 125–127, 1 fig., 1955.

The thiram-containing fungicides used for the control of [unspecified] seed-borne diseases, mostly of peas, beans [*Phaseolus vulgaris*], maize, and flax, tend to cause severe irritation of the mucous membranes of the eyes, nose, and mouth of operators. In the United States this inconvenience has been obviated by the use of slurries (1½ gm. dust in 5 to 7½ ml. water per kg.), which are also expected to be on sale for the first time in Holland during the current year. A special machine known as a 'slurry-treater' is used in America, but the preparations can also be applied in an ordinary dusting cylinder. An apparatus for testing the adhesiveness of slurries is briefly described.

VAN DER KERK (G. J. M.), VAN OS (H. C.), DE VRIES (G.), & SIJPESTEIJN (A. K.). **A new group of organic fungicides.** -Translation of a paper read at the 5th Symposium on Phytopharmacy, Ghent, 5th May, 1953.

This paper comprises a brief survey of organic fungicides in general followed by

a more detailed discussion on recent advances in knowledge of the dithiocarbamic acid derivatives, information about which has been noticed from time to time in this *Review* [*R.A.M.*, 30, p. 177 *et passim*]. The fungitoxicity of the alkylene bis-dithiocarbamates, the alkylene diisothiocyanates, the aromatic isothiocyanates, and some rhodanine (2-thio-2,4-thiazole dione) derivatives, expressed as the minimum concentration in mg. per litre for the complete suppression of growth in the test fungi *Botrytis cinerea*, *Penicillium italicum*, *Aspergillus niger*, and *Rhizopus nigricans* [*R. stolonifer*], is tabulated. The most active compound as yet found is *p*-phenylene bisrhodanine, which in preliminary tests gave good control of *Phytophthora infestans* on potato without any apparent phytotoxic effects.

Feis (N.). **Toekomstige ontwikkeling van de nevelspuit.** [Future development of the mist blower.]—*Meded. Dir. Tuinb.*, 17, 8–9, pp. 674–681, 2 diags., 1954. [English summary.]

From a consideration of the present status of mist-blowing in Holland [cf. *R.A.M.*, 31, p. 476 *et passim*], future developments seem likely to involve the construction of automatic equipment applicable to both orchard and field crop spraying. The blowers will probably be provided with three, four, or more central air outlets, with nozzles for the liquid, producing more or less whirling mist currents consisting of droplets of adjustable size.

Landreth (J.). **Pressure regulation of knapsack sprayers.**—*Tea Quart.*, 25, 3, p. 62, 1 pl., 1954.

Since the regulation of outlet pressures in pneumatic knapsack sprayers was introduced [*R.A.M.*, 32, p. 438] several manufacturers of spray machinery have incorporated pressure regulating devices in sprayers, as recommended by the World Health Organization [34, p. 234]. Constant output pressures are most desirable in low-volume knapsack spraying, particularly as the spray characteristics of a given nozzle alter with any pressure variation. The author describes a pressure regulating valve which operates against an elastic diaphragm with springs above and below, automatically adjusting output to the pressure at which it is set by a handwheel above the upper spring. When fitted with this valve, adjusted to give a nozzle pressure of 40 lb. per sq. in., a Favori-Colibri knapsack was discharged in about eight minutes, giving an output of $18\frac{3}{4}$ gals. per hour against 25 gals. without the valve.

McNew (G. L.). **Research brings results in agricultural chemicals.**—*Agric. Food Chem.*, 1, 1, p. 29, 1953.

This is a popular discussion on various aspects of modern research in agricultural chemicals arranged in the form of answers to a series of questions. Commercially successful organic fungicides include the quinones, dithiocarbamates, heterocyclic nitrogen compounds, quaternary ammonium compounds, chromate metallic complexes, and phenyl mercury compounds. More rapid advances could be made in the production of improved fungicides if the biochemistry and biophysics of the process of infection were better understood.

Davis (D.), Lo (C.-P.), & Dimond (A. E.). **Chemotherapeutic activity of unsubstituted heterocyclic compounds.**—*Phytopathology*, 44, 12, pp. 680–683, 1954.

At the Connecticut Agricultural Experiment Station unsubstituted heterocycles were tested as chemotherapeutants for the control of *Fusarium oxysporum* f. [*F. bulbigenum* var.] *lycopersici* [cf. *R.A.M.*, 32, p. 686]. No chemotherapeutic activity was exerted by five-membered heterocycles whether condensed with one benzene

nucleus or not, but thiophene and furan, condensed with two benzene rings to form dibenzothiophene and dibenzofuran, respectively, significantly reduced the incidence of infection at a concentration of $1{\cdot}5 \times 10^{-3}$M and were allotted vascular indices [33, p. 644] of 0·01 and 0, respectively. Oxygen, sulphur, and carbon were interchangeable in the 5-position as demonstrated by the chemotherapeutic potency of the two above-mentioned compounds and fluorene. Carbazole was not chemotherapeutic but could be reactivated with an alkyl substituent on the nitrogen. A loss of activity generally followed the opening of the carbon to carbon bond between the two benzene nuclei.

Wilson (J. D.). **Wettable powder versus tank-mix dithiocarbamates on Potatoes and Tomatoes in Ohio.**—*Res. Circ. Ohio agric. Exp. Sta.* 9, 22 pp., 1953.

Experiments in the use of commercial dithiocarbamates against early blight of potatoes and tomatoes [*Alternaria solani*: *R.A.M.*, 32, p. 368] and late blight [*Phytophthora infestans*: 32, p. 327] during the last ten years in Ohio showed that methasan slurry was more effective in controlling these diseases than the wettable powder formulations. The average increase in yield per acre of tomatoes when treated with the slurry was 12 bush. more than with the powder. The tank-mix preparations of ziram, zac, and vancide 51 (made by adding zinc sulphate to the partially-diluted dithiocarbamates) were also superior to the wettable powders in controlling these diseases. There is little difference between the efficiency of dithane and parzate (zineb) prepared as wettable powders or as tank-mixtures.

The results obtained by using ziram tank-mix preparations in the control of *A. solani* on tomatoes and potatoes and of tomato anthracnose [*Colletotrichum phomoides*: 32, p. 346] suggest that this fungicide would be effective for many foliage diseases on vegetables in this area and merits further trials.

Recommended common names for pest control products.—*Brit. Stand., 1953*, 1831 (part 2), 8 pp., 1953.

The common name recommended for the fungicide 1:2:4:5-tetrachloro-3-nitrobenzene or 2:3:5:6-tetrachloronitrobenzene is tecnazene.

Maneb—a coined name for the fungicidal chemical manganous ethylenebis (dithiocarbamate).—*Phytopathology*, 44, 12, p. 699, 1954.

The designation 'maneb' for manganous ethylenebis (dithiocarbamate) has been approved by the Interdepartmental Committee on Pest Control, the American Phytopathological Society, the American Chemical Society, and the American Medical Association. The compound has previously been known by its above-mentioned chemical name and also as manganese EBD, MnEBD, and occasionally as MEB. The name 'maneb' refers to the 100 per cent. pure chemical of which the percentage present is to be indicated by a technical grade. A wettable powder formulation designated du Pont 'manzate' fungicide [*R.A.M.*, 31, p. 392 *et passim*] containing 70 per cent. maneb is available on the market.

Svolba (F.). **Giftwirkung von Uransalzen auf die Entwicklung niederer Pilze. Vorläufige Mitteilung.** [Toxic action of uranium salts on the development of lower fungi. Preliminary communication.]—*Sydowia*, 8, 1–6, pp. 34–35, 1954.

Conidial germination in a species of *Penicillium* isolated from lemon juice on a medium consisting of lemon juice and water (1:1) and 3·5 gm. cane sugar per 100 ml. was inhibited by the addition to the solution of uranyl nitrate or uranyl acetate at a concentration of 0·001 M. At 0·003 M the effect of the salts was proportionately stronger and at 0·005 germination was for the most part entirely arrested.

Stevenson (J. A.). **A list of authors of plant parasite names with recommended abbreviations.** Index of Plant Diseases in the United States, pp. 1233–1263, 15th June, 1953.

This is a revision of a list issued in 1944 [*R.A.M.*, 24, p. 35] of recommended abbreviations of authors' names occurring in the Index of Plant Diseases in the United States, used in connexion with plant parasites, including fungi, bacteria, and viruses.

Gorlenko (M. V.). Болезни растений и внешняя среда. [Plant diseases and the external environment.]—119 pp., 8 figs., 1 graph, Moscow, Publishers of the Moscow Society of Nature Research, 1950. 6 Roubles. [Received 1954.]

The author reviews in successive chapters, each with a bibliography, the work done so far in the U.S.S.R. on the effect of the external environment on the host-parasite relationship. Chapter one (pp. 8–20) deals in a general way with the relationship between mass infection of plants and the environmental conditions and the state of the host plant. Methods of changing the status of pathogens of cultivated plants, particularly their spread to fresh regions and to new hosts, are discussed in chapter two (pp. 21–33). The development of parasitism in phytopathogenic bacteria is reviewed in chapter three (pp. 34–42). Chapter four (pp. 43–53) is devoted to problems of plant immunity, particularly in relation to environment and the protectant peculiarities of the plant. Under the title 'Plant diseases and their insect vectors' the author recapitulates in chapter five (pp. 54–62) the information from Russian and foreign literature on insect transmission of bacterial and fungus plant diseases.

Chapter six (pp. 63–80) is concerned with soil as the source of plant infection, viability of phytopathogenic bacteria and fungi in the soil, their control, the importance of plant roots and debris in the soil, the numbers of bacteria present, and the crops sown.

The biological peculiarities of the wheat powdery mildew pathogen (*Erysiphe graminis* f. *tritici*) in the U.S.S.R. [*R.A.M.*, 22, p. 165] are described in chapter seven (pp. 81–108), which includes descriptions of the existing conceptions of the life-cycle of the fungus, means of overwintering of the wheat form and of other forms of *E. graminis* on grasses, and the importance of the individual stages in the life-cycle. Under the climatic conditions of southern and south-eastern U.S.S.R. perithecia start developing in the latter half of May and ascospore formation is complete by August or September when the ascospores are capable of infecting the plant. The critical period of the disease is considered to be between August and October, winter sowings, on which the fungus overwinters in the form of mycelium, this being the source of spring wheat infection [cf. 23, p. 291] and not perithecia remaining on diseased plants. Except in very dry years the fungus is stated to be present on the plant throughout the year. In central and southern U.S.S.R. the fungus overwinters in the form of brown, compact mycelial mats on the lower leaves of winter wheat. Observations on methods of overwintering on grasses showed that *E.g.* f. *poae* occurs only in the conidial state on *Poa pratensis* and *P. sylvestris*, while ascospore formation is rapid on *P. bulbosa*. *E.g.* f. *bromi* overwinters on *Bromus arvensis* only by means of perithecia. Only the conidial state of *E.g.* f. *agropyri* was observed on *Agropyron repens* in 1939–40 and 1942–3, suggesting that it overwinters as mycelium. *E.g.* f. *dactylidis* overwinters on *Dactylis glomerata* either in the form of mycelial mats or, during severe winters, as perithecia. *E.g.* f. *hordei* overwinters on winter barley in central Asia.

Chapter eight (pp. 109–111), dealing with the biology of cereal rusts, gives an account of experiments conducted from 1949 to 1951, in which uredospores of rye stem rust [*Puccinia graminis*: 19, p. 137] on overwintering stems were found to

remain viable throughout the winter. Rye varieties growing in the Moscow region are reported to be susceptible to all forms of *P. graminis*. Root rot of tau-saghyz, [*Scorzonera tau-saghyz*: 16, p. 123] of unknown etiology, usually widespread on plants growing in badly aerated soil, and its control by proper soil aeration are discussed in chapter nine (pp. 112–115).

The last chapter (pp. 116–119) deals with the wilting of the inflorescences of kok-saghyz [*Taraxacum kok-saghyz*] accompanied by sterility and followed later by the invasion of the head by various fungi, *Botrytis cinerea* [cf. 25, p. 329] and *Alternaria* sp. [cf. 31, p. 84] in particular.

Clifton (C. E.), Raffel (S.), & Stainier (R. Y.). **Annual review of microbiology. 8.**—536 pp., 2 pl., 15 figs., 2 diags., 2 graphs, Stanford, California, Annual Reviews, Inc., 1954. $7.

Mechanisms of anti-bacterial action are discussed by W. W. Umbreit on pp. 167–180 of this review [cf. *R.A.M.*, 33, p. 438], with 235 references to the literature up to December, 1953. The antibiotics dealt with include penicillin, streptomycin, chloramphenicol, aureomycin, terramycin, tetracyclene, erythromycin, magnamycin, actithiazic acid, and the toxic peptides.

S. Spiegelman and O. E. Landman (pp. 181–236) survey the literature (481 titles) on the genetics of micro-organisms [loc. cit.] up to December, 1953, under the headings of phenogenetics, transmission genetics and life-cycles, nature and properties of genetic material, and methods.

Bacterial viruses, with particular reference to their synthesis, are dealt with by E. A. Evans (pp. 237–256, 158 references).

A bibliography of 239 titles forms the basis of a discussion of foods and feeds from fungi by F. S. Thatcher (pp. 449–472) covering the production of fats and proteins by micro-organisms, the nutritional value of fungi and their products, foods from bacteria, substrates for microbial food production, and advances in fermentation technology.

Diseases of crops.—*Agric. Anim. Husb., Uttar Pradesh*, 3, 10–12 (special number), 105 pp., 1953. [Received April, 1955.]

The 40 papers in this copiously illustrated number present to growers and farmers essential information concerning the most important diseases of field, fruit, and vegetable crops occurring in Uttar Pradesh, India [cf. *R.A.M.*, 33, p. 215; 34, p. 81].

Sauthoff (W.). **Über toxische Stoffwechselprodukte in Kulturfiltraten von Botrytis cinerea Pers.** [On toxic metabolic products in culture filtrates of *Botrytis cinerea* Pers.]—*Phytopath. Z.*, 23, 1, pp. 1–36, 1 fig., 10 graphs, 1955.

In further studies at the Technical College, Hanover, Germany, the toxin in culture filtrates of *Botrytis cinerea*, active against peas and *Helxine soleirolii* [*R.A.M.*, 32, p. 269], was shown by means of the *Ustilago zeae* [*U. maydis*] spore germination test [32, p. 32] to be identical, in all probability, with the anti-fungal principle. In culture on a synthetic medium known as Fries II, containing 20 gm. glucose and 5 gm. ammonium tartrate with the addition of 100γ aneurin [vitamin B_1] per l., the maximum degree of toxicity corresponded approximately to 7 Eu.z. (units of *U. maydis*). This was raised to 200 by the admixture with the substratum of 1 per mille agar. Ammonium tartrate (which is replaceable within limits by ammonium citrate) is important for the production of strongly toxic filtrates.

Stalagmometric measurements demonstrated the reduction of the surface tension of culture filtrates by the metabolic products of *B. cinerea* by up to 15 dyn. per cm., the process being mainly confined to the period of active mycelial growth.

It is considered probable that the toxin shown to reside in the fungus *in vitro* is

related to its pathogenicity *in vivo*, but the question cannot be definitely settled pending further intensive investigations.

YARWOOD (C. E.) & JACOBSON (L.). **Accumulation of chemicals in diseased areas of leaves.** *Phytopathology*, 45, 1, pp. 43–48, 10 figs., 2 diags., 1955.

In further experiments at the Departments of Plant Pathology and Plant Nutrition, University of California, Berkeley, leaves inoculated with various fungi and viruses were exposed to vapours from radio-active sulphur (S^{35}) [*R.A.M.*, 29, p. 471], radio-active phosphorus (P^{32}), and carbon^{14} sucrose in different ways and the accumulation of radio-activity was followed by means of radio-autographs in a Geiger-Müller counter. In direct application to the foliage there was a larger accumulation of the radiochemicals in the diseased than in the sound tissue in 19 host-pathogen combinations, including bean (*Phaseolus vulgaris*) —*Uromyces phaseoli* [*U. appendiculatus*], —*Erysiphe polygoni*, and —tobacco mosaic virus, broad bean —*Ascochyta pisi*, cucumber—*E. cichoracearum*, peach —*Taphrina deformans*, pear—*Venturia pirina*, vine (*Vitis californica*) —*Plasmopara viticola*, hops—*Pseudoperonospora humuli*, *Nicotiana glutinosa*—tobacco mosaic virus, barley *Pyrenophora teres*, *Aesculus californica* —*Septoria aesculi*, *Antirrhinum majus* —*Puccinia antirrhini*, and *Iris* sp. *Heterosporium gracile* [*Didymella macrospora*]. In five the amounts were smaller, i.e., apple—*Podosphaera leucotricha*, oak (*Quercus agrifolia*) *Sphaerotheca lanestris*, rose—*S. pannosa*, cabbage—*Albugo candida* [*Cystopus candidus*], and *Clematis* sp.—*Puccinia rubigo-vera* [*P. triticina*], while in six there were no clear-cut differences. In tests with tobacco mosaic virus on *N. glutinosa* 19 times as much radio-active sulphur accumulated in five-day local lesions as in healthy tissue. In the lesions produced by *U. appendiculatus* on bean the sulphur formed a zonate pattern.

In experiments on the accumulation of radio-active phosphorus and carbon–14 by translocation, the degree of selective accumulation in rusted bean leaves was much greater where the chemicals were applied directly to the diseased foliage. For instance, in a test with a healthy leaf in a solution with P—32 and the opposite half-rusted leaf in water, 7,870 times as much of the chemical accumulated in the diseased as in the sound portion of the same leaf. Selective accumulation, which is tentatively attributed to high metabolic activity in the pathogen or infected host cells, was also observed to a lesser extent when *U. appendiculatus* was destroyed in the living leaf.

GETTKANDT (GISELA). **Zur Kenntnis des Phototropismus der Keimmyzelien einiger parasitischer Pilze.** [Contribution to the knowledge of phototropism in the germ-mycelia of some parasitic fungi.] *Wiss. Z. Martin-Luther-Univ.*, 3, 3, pp. 691–709, 18 figs., 6 diags., 1954.

The phototropic reactivity of the germ-mycelia of 12 rusts [cf. *R.A.M.*, 10, p. 587] and *Botrytis cinerea* (all of which made good growth on 7 per cent. gelatin) was studied at the Martin Luther University, Halle, Germany, *Puccinia simplex* [*P. hordei*], *P. glumarum*, *P. antirrhini*, *P. suaveolens* [*P. obtegens*], *P. menthae*, *P. magnusiana*, *Phragmidium subcorticium* [*P. mucronatum*], and *Uromyces pisi* being investigated from this angle for the first time. Phototrophic indifference was exhibited only by the uredospore germ-tubes of *Puccinia glumarum*, *P. antirrhini*, and *P. obtegens*, and those of the aecidiospores of *P. magnusiana* and *U. pisi*. All the others (comprising besides the foregoing *P. dispersa*, *P. coronata*, *P. triticina*, and *P. poarum*) reacted to unilateral illumination by a well-defined negative phototropism; only in the last-named species was the response somewhat weaker. It seems reasonable to interpret this response as an adaptation to the parasitic mode of life. The threshold value of illumination intensity which just permits the observation of a visible phototropic reaction in *P. triticina* is 4·4 Mx (specific

metre candles). The limit of long-wave spectral sensitivity for the same species and *P. secalis* lies between 450 and 480 mμ. Phototropic inversion took place under liquid paraffin.

Dickinson (S.). **Studies in the physiology of obligate parasitism. V. Further differences between the uredospore germ-tubes and leaf hyphae of Puccinia triticina.** *Ann. Bot., Lond.* N.S., 19, 74, pp. 161–171, 1 graph, 1955.

In this fifth study undertaken at the School of Agriculture, Cambridge, on obligate parasitism [cf. *R.A.M.*, 28, p. 517], the carotin pigment in *Puccinia triticina* was found to be in an oxidized state in the germ-tubes, while in a reduced condition in the uredospores, appressoria, substomatal vesicles, etc. Germ-tubes are less permeable to dyes than hyphae in the [wheat] leaf. Both germ-tubes and leaf hyphae are affected by relative humidity, but only the former change their direction of growth towards a higher relative humidity. This evidence seems to indicate that the physiological change taking place at the end of the ectophytic stage (i.e., after formation of substomatal vesicles) is a modification in cell-wall permeability.

Bercks (R.). **Weitere Infektionsversuche mit verschiedenen X-Virusherkünften an Kartoffeln.** [Further inoculation experiments with various sources of virus X on Potatoes.]—*Züchter*, 24, 9, pp. 271–273, 1954.

In further experiments in 1953 at the Institute for Virus Serology, Biological Institute, Brunswick, Germany, all the shoots of the Frühbote, Oberarnbacher Frühe, Sieglinde, Heida, Sabina, Ackersegen, and Capella potato varieties inoculated with isolates of potato virus X from eight sources [cf. *R.A.M.*, 33, p. 497] became diseased and in most cases infection spread to others. There were, however, a few exceptions, e.g., the virulence of the isolate from Panther was distinctly reduced on Ackersegen and Sieglinde, which was also largely immune from attack by the Markredwitzer Frühe and Niederarnbacher Jacobi strains, while Frühbote sustained little damage from the Roswitha isolate, denoting that the development of infection does not depend exclusively either on the virus or on the variety but on a combination of both factors. It was further shown by quantitative studies that the virus concentration within a given variety may fluctuate considerably with the particular strain involved.

Kloosterman (E. G.). **De invloed van de bladrolziekte op de opbrengst van de Aardappel.** [The influence of the leaf roll disease on the Potato yield.] Abs. in *Tijdschr. PlZiekt.*, 61, 1, p. 20, 1955.

In 1,000-plant plot tests in the Veen district of Holland in 1953 the average yields of healthy and leaf roll virus-diseased Voran potatoes [see next abstract] were 1,144 and 404 gm. per plant, respectively, and the corresponding specific gravities 381 and 353 gm., representing tuber and starch reductions of 65 and 8 per cent., respectively. By dividing the plots into blocks of 25 plants and determining the percentage of infection and yield in each, every per cent. of leaf roll was calculated to involve a half per cent. fall in yield. In 1954 the experiment was repeated with the Record variety, in which the average yields of healthy and infected plants were 1,115 and 480 gm., respectively, a reduction due to the disease of 57 per cent. There was no loss of starch in this test.

Rozendaal (A.). **De betekenis van verschillende virusgroepen voor de teelt van Pootgoed.** [The significance of different virus groups in seed Potato production.] *Landbouwvoorlichting*, 11, 6, pp. 299–308, 1954. [English summary.]

The most important of the potato viruses occurring in Holland is leaf roll [see preceding abstract], of which three strains have been differentiated at the Phyto-

pathological Laboratory, Wageningen [*R.A.M.*, 32, p. 145], a mild, an intermediate, and a severe. Plants infected by the first-named are premunized against attack by the two others. A relationship has been demonstrated between leaf roll and spindle sprout.

During the last few years many different types of X-virus symptoms have been shown in the field by the Duke of York variety, which carries the 'B' (Quanjer's top necrosis) strain of the virus [10, p. 746]. The latter confers no protection against other X-virus strains in the same variety. Mottled or crinkled plants are a formidable source of virus X infection in the field, since most Dutch potato varieties are hypersensitive to virus X^B but not to other strains. Only clonal selections of Duke of York free from strains other than B are used for foundation seed production. Alpha, Eigenheimer, Ideaal, and some other varieties are very tolerant of virus X, contracting heavy infection which can be controlled only by the exclusive use for seed of clonal selections with a negative serological reaction. In 1953 over 1,000,000 plants were tested in this way.

Besides the mild, intermediate, and severe strains of virus A carried, respectively, by 'light' Industrie, Julinier, and Saucisse Rouge, a further mild strain has been found in nearly all clones of Erdgold, necessitating stringent selection of individuals for foundation seed increase.

Virus Y is divisible into two serologically related groups of strains, designated stipple-streak and common. The Zeeuwse Blauwe, Thorbecke, and Belle de Fontenay varieties each contain a different strain of the former group. In most Dutch varieties the Zeeuwse Blauwe strain induces much more virulent symptoms than the one from Belle de Fontenay. In many respects the stipple-streak strains of virus Y closely resemble virus C [a strain of potato virus Y: 16, p. 53], one difference being that the latter is not transmissible by aphids. Alpha, Industrie, and other varieties are field-resistant to the stipple-streak group of virus Y strains, the basis for this reaction being hypersensitivity. Such varieties respond to tuber plug graft inoculation by severe foliar and tuber necrosis. On the other hand, some of the older varieties, e.g., Zeeuwse Blauwe and Thorbecke, which react merely by faint mottling, harbour 100 per cent. infection. In the field the common virus Y strains are much more generally infectious than those of the stipple-streak group. The new Dutch variety Surprise is highly resistant (hypersensitive) to both groups of strains.

On most varieties the symptoms of infection by potato virus S [34, p. 245] are almost imperceptible, this being no doubt the reason for its late discovery. Bevelander, Gloria, Koopman's Blauwe, Libertas, Meerlander, Profijt, Souvenir, and Ijselster react to inoculation by a mild mosaic not unlike that caused by potato virus X. None of the 150 varieties tested developed typical stem, petiole, or leaf necrosis. All current Dutch stocks of Duke of York and its mutant Red Duke of York, 'dark' and 'light' Industrie, Flava, and Katahdin were shown by serological tests to be consistently infected by virus S.

None of the six viruses under discussion (including aucuba mosaic besides those already mentioned) is soil-borne.

Plant diseases. Leaf roll and spotted wilt of Potato. *Agric. Gaz. N.S.W.*, 65, 3, pp. 163–164, 3 figs., 1954.

Notes are presented on the symptoms, transmission, and control of the leaf roll [*R.A.M.*, 34, p. 285] and tomato spotted wilt viruses [31, p. 451; 33, p. 212] affecting potato in New South Wales. Leaf-rolling is generally very distinct on Sebago, particularly under dry conditions. Spotted wilt is usually most severe in crops near densely populated areas but may also be prevalent in the main tableland potato areas. Control of both viruses comprises roguing diseased plants, green-sprouting tubers prior to planting and selecting those bearing healthy shoots,

saving seed from the spring crop only from healthy plants for autumn planting, and using resistant varieties. Katahdin is highly resistant to spotted wilt.

Tanaka (I.), Narita (T.), Oshima (N.), & Goto (T.). **Witches' broom of Potatoes in Hokkaido and its host range.**—*Res. Bull. nat. agric. Exp. Sta. Hokkaido* 64, pp. 100–112, 17 figs., 1953. [Japanese, with English summary.]

A disease of potatoes which has occurred in Hokkaido, Japan, since 1932, and has greatly increased between 1949 and 1952, appears to be identical with the witches' broom virus disease described from the Pacific Northwest [*R.A.M.*, 4, p. 55; 33, p. 751]. Potatoes cultivated on reclaimed land since 1949 in the Iburi Original Seed Potato Production Farm are becoming infected. Of various species of the Solanaceae graft-inoculated with the virus, *Solanum nigrum*, eggplant, *Datura stramonium*, *Nicotiana sylvestris*, *N. rustica*, tobacco, *N. glauca* (symptomless carrier), and tomato were susceptible.

Trials of substitutes for sulphuric acid for Potato haulm killing, 1952 and 1953.—*Plant Path.*, 3, 3, pp. 90–99, 24 graphs, 1954.

This contribution from the Conferences of crop husbandry officers and plant pathologists of the National Agricultural Advisory Service, compiled by E. C. Large, describes the 1952 and 1953 co-operative trials at 11 centres in England to compare the effectiveness of substitutes for sulphuric acid for the destruction of potato haulms [*R.A.M.*, 32, p. 395]. The results demonstrated that in point of efficiency and rapidity in killing the haulms and weeds sulphuric acid was the best of the chemical treatments. Sodium arsenite at high or low volume and tar oil fractions such as TOF54 at low volume acted more slowly, but proved satisfactory substitutes. Both materials can be used in machines not specially constructed to resist acid, but sodium arsenite, being poisonous, must be handled and stored with care and not allowed to drift on to neighbouring fruit, edible green crops, or grass.

Ammonium thiocyanate liquors proved potentially valuable haulm killers, possessing substantial advantages in that they are non-poisonous, non-oily, and free from a persistent phenolic odour.

For the prevention of blight [*Phytophthora infestans*] in the tubers of ware crops grown in England and Wales, efficient mechanical haulm destruction appears to be as satisfactory a method as any, provided that lifting is not carried out until at least 14 days after the operation.

Where potatoes have to be lifted early, haulm destruction may prevent blight infection at lifting. But where, as in the great majority of ware crops in England and Wales, lifting is not begun until late September or October, by which time the haulm has died a natural death, haulm destruction is more effective in clearing the ground and destroying weeds than in preventing blight in the tubers. If, as usually happens, the haulms are not destroyed until blight on the foliage has reached the 25 to 75 per cent. stage, it is often too late to prevent more than about half of the tuber infection. If the haulms are destroyed before the 75 per cent. stage is reached (when this occurs before mid-September), loss of crop may result. For the prevention of tuber infection in the soil, good soil cover, the choice of a variety not too susceptible to tuber blight, and preventive spraying to protect the haulms as long as possible, may prove much more important than haulm destruction.

Kaiser (W.). **Zur Frage der Resistenz der Kartoffel gegenüber Phytophthora infestans.** [The problem of resistance of the Potato to *Phytophthora infestans*.] —*Beitr. Biol. Pfl.*, 31, 2–3, pp. 293–296, 1955.

This paper constitutes an extremely brief review of the development of resistance to *Phytophthora infestans* [cf. *R.A.M.*, 34, p. 242] in the potato in relation to physiologic races from 1895 to the present day. It is based on a reference list of 15 items.

Wriedt (G.). **Ein Beitrag zur Aufstellung eines über Samen vermehrbaren Testsortimentes für Phytophthora infestans (Mont.) de Bary.** [A contribution to the assembly of an assortment of test plants for *Phytophthora infestans* (Mont.) de Bary which can be propagated by seed.]—*Z. PflZücht.*, 34, 2, pp. 125–156, 7 figs., 1955.

At the Max Planck Institute for Breeding Research, Voldagsen, Western Germany, the uninucleate condition of the zoospore of *Phytophthora infestans* [cf. *R.A.M.*, 34, p. 391] was followed from its differentiation in the sporangium up to the production of the germ-tube. Two-year-old monospore cultures gave rise to new races [34, p. 393], presumably through spontaneous mutation. The races maintained at the Institute were tested on a German and an English hybrid assortment of potato varieties [33, p. 250] with comparable results. Several species of Tuberariae were tested for their reactions, some to three and some to seven races. A number of clones of *Solanum demissum*, *S. stoloniferum*, and *S. polyadenium* might serve as sources of resistance to *P. infestans*, but their homozygosity is doubtful in some cases and requires further confirmation. Six races were differentiated on the basis of the tests, i.e., A (from which B_1 is indistinguishable), C, B_2, H, F, and I. No indication of resistance to races A, B, H, and I was obtained in experiments on 14 species and varieties of *Lycopersicon*, including several commercial types of tomato.

Maklakova (Mme G. F.). Определение устойчивости пасленовых к фитофторе. [Determining the resistance of solanaceous plants to *Phytophthora*.]—Земледелие [*Zemledelie, Moscow*], 2, 9, pp. 111–113, 1954.

During four years, starting in 1947, trials were carried out in the northern part of the U.S.S.R. to evaluate varietal resistance of solanaceous plants to *Phytophthora* [*infestans*: *R.A.M.*, 33, p. 753]. Of 200 hybrid selections from the potato variety Kameraz, 53 [unspecified] proved highly resistant. Using a spore suspension injection method the tomato varieties Smorodinovidny, Gruntovny Alpat'ev, Vuinoslivny, and Mayak were found to be resistant in the field under northern conditions, *L*[*ycopersicon*] *peruvianum*, so far regarded as immune, showed slight infection in 1949. *L. hirsutum* remained free from infection even under the worst epidemics in the field. It was immune from all the most virulent strains of the fungus in artificial inoculations.

Gedz (S. M.). Вегетативная гибридизация Картофеля при помощи прививки столонов. [Vegetative hybridization of Potato by means of stolon grafting.]—Земледелие [*Zemledelie, Moscow*], 2, 11, pp. 80–81, 1 fig., 1954.

For obtaining by graft combinations potatoes resistant to wart [*Synchytrium endobioticum*: *R.A.M.*, 34, p. 315] stolon grafts were made at Chernovitsky State University, U.S.S.R., at the time of flowering. A distinct reduction was observed in infection of tubers subsequently obtained following a single grafting of stolons of the susceptible varieties Lorh, Epron, Ella, and Alma on to stolons of resistant plants of Ostbote, Jubilee, Oktyabrenok, Hrentsmark, and Majestic. The first tuber generation, resulting from grafting a stolon of the resistant Borodyansky on to susceptible Wohltmann, was susceptible, while resistant Karnea on Wohltmann resulted in only slightly susceptible progeny.

Follin (C.). **Skadegörare av internationell betydelse. Potatiskräfta (Synchytrium endobioticum).** [Pathogens of international importance. Potato wart (*Synchytrium endobioticum*).]—*Växtskyddsnotiser, Stockh., 1954*, 5–6, pp. 82–86, 1954.

Valuable information is presented from the recent reports of the European Plant Protection Organization concerning the present status of potato wart (*Synchytrium*

endobioticum) in Sweden [*R.A.M.*, 33, p. 555] and other countries [C.M.I. map No. 1]. The total number of foci detected in Sweden over the period from 1928 to 1953 was 2,903, an average of 111 per annum. New records in 1951, 1952, and 1953 numbered 105, 90, and 181, respectively. In Denmark [34, p. 347] there were 10 new notifications in 1952 and 15 in 1953. New cases reported in Norway [30, p. 242] numbered 22 in 1951, 13 in 1952, and three in 1953, the total for the country being 777, of which 180 have been declared non-infectious. In Finland [28, p. 482] 12 fresh outbreaks were notified in 1951, six in 1952, and 14 in 1953.

The position with regard to the cultivation of immune varieties and the quarantine regulations operating in different countries is summarized. A working party of the European Plant Protection Organization decided in 1951 that a minimum distance of 5 km. should lie between a given site of potato cultivation and any focus of wart disease. This is the radius allowed in Algeria, Portugal, Finland, Austria [30, p. 640], and Sweden, whereas in Holland and Great Britain the corresponding limits are only 500 m. and 2 km., respectively, while in Yugoslavia they are fixed at 10 km. and in Belgium and Poland at 20 km. Such long distances are considered by the working party to be without biological justification, as also are the time limits, e.g., of five years in Austria and ten in Finland for absence of the pathogen from the prescribed radius, since its resting sporangia have been shown by experiments (in Sweden, for instance) to retain their virulence for 15 to 20 years in the soil without access to susceptible varieties.

Bonde (R.) & Schultz (E. S.). **Purple-top wilt and similar diseases of the Potato.**—*Bull. Me agric. Exp. Sta.* 511, 30 pp., 8 figs., 1953.

Purple-top wilt [strains of aster yellows virus: *R.A.M.*, 34, p. 54] is an important potato disease which may cause great losses by reducing plant growth. The leaf-rolling symptom resembles that associated with primary leaf roll, stem-girdling caused by *Rhizoctonia* [*Corticium solani*] and *Botrytis* [*cinerea*], black leg [*Erwinia phytophthora*], and *Verticillium* wilt [*V.* spp.]. The symptoms of purple-top wilt and apical leaf roll virus [loc. cit.] are often confused.

In experiments in Maine purple-top wilt plants produced tubers with varying degrees of wilting. In one experiment with Katahdin only 44 per cent. of tubers were firm and apparently normal, 20 per cent. slightly wilted, and 36 per cent. soft and severely wilted; 37 per cent. of the apparently normal tubers, 41 per cent. of the slightly wilted, and 81 per cent. of the badly wilted tubers failed to grow.

The symptoms may be confined to one stalk or part of a plant although most of the tubers are infected. The disease affects Sebago less severely than Katahdin but neither variety is suitable for seed purposes. It is most severe in the year following infection, complete recovery occurring during the second year. Apical leaf roll on the other hand was perpetuated with undiminished virulence in the seed stocks. Stocks originating from recovered purple-top plants were not immune from re-infection. No current season symptoms of purple-top wilt were obtained by grafting to healthy plants whereas apical leaf roll and 'haywire' viruses were readily graft-transmitted with subsequent current-season symptoms. Inarch-grafts with purple-top, however, did produce weak sprouts in the seed tubers. Tomato plants inarch-grafted with purple-top potato tissue developed symptoms similar to those in potato. Apical leaf roll and witches' broom on tomato caused downward bending of the leaves and upward rolling of the leaflets with little or no chlorosis. *Macrosteles divisus* caught in the field were fed on annual sow thistle (*Sonchus asper*) showing aster yellows symptoms and transferred to potato plants. One potato developed witches' broom symptoms. In other cases the tubers from inoculated plants produced plants which developed apical leaf roll symptoms.

There was evidence that six to eight applications of DDT during the growing season controlled both *M. divisus* and the spread of purple-top wilt.

Vicente (R.). **Paralización de la podredumbre del tubérculo de Patata durante su período de germinación.** [Inhibition of the rot of the Potato tuber during its germination period.] *An. Edafol. Fisiol. veg.*, 13, 9–10, pp. 705–723, 6 figs., 1954. [English summary.]

In 558 experiments performed during 1953 at the Institute of Edaphology and Plant Physiology, Madrid, Alava, Frühgold, Victor, and Sergen potato tubers which were already germinated at the time of inoculation with strains of *B[acterium] carotovorum* [*Erwinia carotovora*], *B. phytophthorum* [*E. phytophthora*], *B. atrosepticum* [*E. atroseptica*], and *B[acillus]s polymyxa* (supplied by the Botany School, Cambridge) produced more plants (75 per cent.) and heavier yields (83 per cent.) than ungerminated (30 and 12, respectively). In the latter series 70 per cent. of the tubers were abortive as compared with 25 per cent. in the former. Removal of the sprouts at the time of inoculation reduced the number of plants from 93·5 to 75 per cent. and plants producing new tubers from 83·7 to 63·2 per cent., while the percentage of undeveloped tubers was increased from 16·28 to 36·7 per cent.

It is concluded that at the time of germination the tissues of mature tubers contain a bacteriostatic principle which arrests infection and protects the young plants in the first stages of growth [cf. *R.A.M.*, 25, p. 415; 30, p. 340; 32, p. 448].

Stapp (C.) & Spicher (G.). **Zur Frage der Resistenzverschiedenheiten pflanzlicher Wirte gegenüber pathogenen Bakterien und ihre Ursachen. I. Mitteilung. Untersuchungen mit Erwinia phytophthora, dem Erreger der Schwarzbeinigkeit und Knollennassfäule der Kartoffel.** [On the question of the differences in resistance of plant hosts to pathogenic bacteria and their causes. Communication I. Studies with *Erwinia phytophthora*, the agent of black leg and tuber wet rot of Potato.]—*Zbl. Bakt.*, Abt. 2, 108, 17–18, pp. 465–481, 2 figs., 7 graphs, 1955.

At the Biological Institute, Brunswick, using a method based on the determination of the rate of spread of infection in the shoot axis under constant external conditions, the authors tested the reactions to *Erwinia phytophthora*, an agent of potato black leg and tuber rot [*R.A.M.*, 32, p. 642], of 31 Solanaceae. Only three species were resistant, viz., *Cyphomandra betacea*, *Solanum dulcamara*, and *S. parodii*, the first-named highly so. All eight species of *Nicotiana*, including Geudertheimer, Havanna III 3, and Samsun tobacco and *N. rustica*, were very highly susceptible. Other susceptible hosts included *Datura stramonium* and *D. tatula*, *Nicandra physaloides*, *Physalis peruviana*, *Schizanthus pinnatus*, and tomato.

It is postulated that resistance depends on the capacity of a given host for rapid suberization of the invaded tissue, thereby discouraging the production by the bacteria of the pectic enzymes concerned in the process of decay [7, p. 192; 32, p. 476].

Mastenbroek (C.). **A note on resistance of Solanum-species to powdery mildew.**—*Euphytica*, 4, 1, pp. 15–16, 1955. [Dutch summary.]

The author observed a small area of potato plants infected by powdery mildew (*Oidium solani*) [*Erysiphe ? cichoracearum*: *R.A.M.*, 33, p. 753] in a trial field in the Netherlands during 1945 and again in 1950 and 1951. The disease usually appears in the greenhouse in late autumn on old and young leaves of plants of all ages, and it is also common on late-maturing potatoes grafted on tomatoes. During 1953 a small collection of tuber-forming *Solanum* spp. was planted in August to facilitate tuber set under natural short day conditions. They ripened very late and the *S. demissum* plants were severely attacked by powdery mildew [loc. cit.]; all the others, viz., *S. antipoviczii* 82, *S. longipedicellatum*, *S. macolae*, *S. polyadenium*, *S. sucrense*, and *S. simplicifolium* and its hybrids with Alpha, Furore, and *S. macolae*, were free.

Mooi (J. C.). **Knolaantasting bij enige Aardappelrassen door Colletotrichum atramentarium (Berk. et Br.) Taub.** [Tuber infection of some Potato varieties by *Colletotrichum atramentarium* (Berk. & Br.) Taub.]—Abs. in *Tijdschr. PlZiekt.*, 61, 1, pp. 22–23, 1955.

Colletotrichum atramentarium has been found attacking stored Saskia potato tubers in Holland [C.M.I. map No. 190], the incidence of infection increasing from November onwards. Typical symptoms developed on tubers exposed to the light after inoculation, while heavy infection also occurred on those of plants grown in contaminated soil in pots. The results of experiments on a semi-commercial scale in 1952–3 and 1953–4, using Saskia tubers from about ten growers, revealed a close correlation between the incidence of *C. atramentarium* and the lifting date, which should be as early as practicable to avoid extensive damage [cf. *R.A.M.*, 34, p. 244]. Infection was heavier on tubers kept in boxes under glass than on those stored in sacks in a barn. Treatment with a mercurial potato disinfectant, applied soon after lifting, gave a considerable measure of control. The development of the pathogen was promoted by shallow planting and an insufficient supply of nitrogenous manure. Voran and other varieties are also susceptible to *C. atramentarium*, but much less so than Saskia.

Thirumalachar (M. J.) & Pushkarnath. **Resistance of Potato varieties to charcoal rot.**—*Amer. Potato J.*, 30, 3, pp. 73–77, 1953.

Charcoal rot (*Macrophomina phaseoli*) [*R.A.M.*, 24, p. 202; 31, p. 540] is fairly widespread in the potato-growing areas of Bihar, Uttar Pradesh, and a few other places in India. Losses may range from 5 to 70 per cent., depending upon predisposing environmental factors, especially warm weather. Early harvesting and certain other cultural practices reduce infection, but the development of resistant varieties is highly desirable.

At the Central Potato Research Institute, Patna, two lines of investigation are being pursued. Varieties are grown in infected soil under conditions favouring infection in order to assess varietal resistance, and the genetic resistance or immunity is assessed by laboratory inoculations of tubers with pure cultures of the fungus. The degree of resistance is indicated thus: O = immune, I = resistant, II = moderately susceptible, and III = susceptible.

So far, resistance (I) has been found only in Mackelvies 305/50, C.P.S. 797, and C.P. 798. The last two are *Solanum andigenum* varieties, while the first is an *S. tuberosum* variety.

The O-reaction (immunity) was given only by certain clonal lines of an interspecific hybrid between species belonging to the series *Commersoniana*. Further work is in progress.

Servazzi (O.). **La cancrena secca della Patata.** [Dry rot of the Potato.]—*Ital. agric.*, 4 (*1953*), 6 pp., 4 figs., 1953. [Received 1954.]

Heavy losses are sustained annually in Italy from dry rot disease of potatoes caused chiefly by *Fusarium caeruleum* [*R.A.M.*, 33, p. 313], which is widely distributed. It is primarily a wound parasite but under excessively humid conditions in the field or in storage it may enter through the stolon. In general early varieties such as Majestic, Magnum Bonum, Early Rose, and Arran Pilot are the most susceptible, and late ones the most resistant. The possibility of there being biologic forms of the pathogen cannot be overlooked. In the field the disease is favoured by excessive nitrogenous fertilizers and insufficient potassium as well as by all conditions unfavourable to normal tuber development. Seventeen other species and varieties of *Fusarium* associated with a similar kind of rot are listed.

Preventive measures include storing only whole, uninjured tubers, under dry,

well-ventilated, and adequately illuminated conditions at a temperature of 2° to 4° C. From time to time the tubers should be examined and those showing signs of disease or early sprouting removed. If the store has contained rotted tubers the walls, floor, and benches should be disinfected with 5 per cent. formalin or 2 per cent. copper sulphate solution, and thoroughly dried and ventilated before being used again.

Mukulá (J.). **Perunan varastoimistappioista ja niiden ehkäisemisestä.** [Storage losses of Potatoes and their control.] —*Valt. Maatalousk. Julk.* 137, 39 pp., 3 figs., 10 graphs, 1953. [English summary.]

From 1948 to 1951 further investigations on potato storage [cf. *R.A.M.*, 27, p. 579] were carried out at the Agricultural Research Centre, Tikkurila, Finland. Storage losses from rot caused by *Phytophthora infestans* and *Fusarium caeruleum* amounted to 3 or 4 per cent. during the winter, and no chemical tested was effective in their control. The losses were increased by high temperature, especially if the potatoes were wet, but not by high relative humidity. Sprouting began at the end of May in storage bins, but was inhibited until August by the use of fusarex (3 per cent. tecnazene) [30, p. 429], belvitan K (6 per cent. α-methylnaphthylmethylether) and reposine. Total losses of treated potatoes were about the same as untreated during winter storage but much lower in the summer, when losses from untreated potatoes were as high as 30 per cent. by the beginning of August.

Baldacci (E.) & Boncompagni (T.). **Discriminazione di varietà dell'Actinomyces scabies e loro distribuzione geografica.** [Differentiation between varieties of *Actinomyces scabies* and their geographical distribution.]—*Nuovo G. bot. ital.*, N.S., 58, 1, pp. 180–181, 1951.

In view of the diverse names used for the *Actinomyces* spp. isolated from scabbed potatoes in various countries [*R.A.M.*, 16, p. 774] the authors propose the adoption of the following nomenclature: *A. scabies* emend. Waksman 1919 for the organism in North America [34, p. 244] and the new varieties *A. scabies* var. *anglica*, distinguished by the yellowish pigmentation of the substrate and the more marked grey colouring of the aerial mycelium, in the British Isles [32, p. 358] and var. *continentalis* (syn. *A. chromogenus* Gasperini 1894 p.p.) producing a black pigmentation of the substrate, in Europe [32, p. 692; 34, p. 316].

Špehar (V.) & Panjan (M.). **Uzročnik vodenaste gnjiloće Krumpira.** [The cause of watery rot of Potato.] —*Zasht. Bilja* [*Plant Prot., Beograd*], *1954*, 22, pp. 24–29, 2 pl. (between pp. 16–17), 1954. [French summary.]

Studies at the Institute for Plant Protection, Zagreb, Yugoslavia, suggest that *Pythium ultimum* [cf. *R.A.M.*, 28, p. 203] was responsible for watery rot of potato which was first observed in the country, in Croatia, in 1952.

Artificial inoculations of potato tubers using potato agar inoculum of *Pythium* sp. isolated from potato and from damped-off tomato seedlings suspected of being infected with *P. debaryanum* [loc. cit.] resulted in 99 and 1 per cent. infection, respectively. Inoculations with carrot agar inoculum of the tomato isolate, however, resulted in 80 per cent. infection. Both isolates produced identical symptoms characteristic of potato watery rot. Climatic conditions in 1952, namely, a hot, dry summer favourable to the development of potato watery rot, point to the presence of *P. ultimum*. This view is further supported by the thickness of the oospore wall.

Mello-Sampayo (T.) & Vianna E Silva (M.). **Ensaios preliminares sôbre a determinação de resistência de algumas formas cultivadas de Arroz à Piricularia oryzae Br. et Cav.** [Preliminary experiments on the determination of

resistance of some cultivated forms of Rice to *Piricularia oryzae* Br. & Cav.]—Ministerio da Economia, Comissão Reguladora do Comércio de Arroz, Lisbon, 38 pp., 6 figs., 2 graphs, 1954. [English summary.]

Following a brief survey of the literature on the history, symptoms, and biology of rice blast (*Piricularia oryzae*), the authors describe and tabulate the results of experiments in Portugal [C.M.I. map No. 51; *R.A.M.*, 32, p. 642] to determine the reactions to the pathogen of 82 varieties and the wild species *Oryza glaberrima* and *O. minuta*, with a view to their potential use as breeding material at the National Agronomic Station [Sacavém]. Seedlings with three to five leaves were sprayed with a conidial suspension and immediately transferred for 24 hours to a controlled environment at a temperature of 26·5° C., high humidity, and shade.

The two wild species and 27 varieties, including Zenith Fortuna, Boston, and Improved Blue Rose, remained immune from infection, while Rinaldo Bersani and four other varieties were only mildly attacked.

Toro, new variety, is leader in Louisiana yield tests.—*Rice J.*, 57, 12, p. 14, 1954.

Toro, a new rice variety developed at the Rice Experiment Station, Louisiana, from Bluebonnet × an unnamed selection obtained from crosses between Rexoro and Blue Rose, gives higher yields than Bluebonnet and Sunbonnet and has so far shown less kernel smut [*Neovossia horrida*: *R.A.M.*, 23, p. 119].

Teunisson (Dorothea J.). **Influence of storage without aeration on the microbial populations of rough Rice.**—*Cereal Chem.*, 31, 6, pp. 462–474, 1 fig., 1954.

At the Southern Regional Research Laboratory, New Orleans, Louisiana, combine-harvested rice, air-dried to 14·3 per cent. moisture or less, contained moderate to large numbers of moulds [*R.A.M.*, 32, p. 507]. Samples of the Zenith variety with 18 to 20 per cent. moisture, sealed in a glass-lined bin for seven months in one trial and 34 days in another, turned sour, presumably in consequence of insufficient aeration and the associated proliferation of yeasts and survival of bacteria. Of the 90,000 moulds per gm. detected before storage, approximately 40 per cent. were species of *Fusarium*, 25 per cent. *Penicillium* spp., and 22 per cent. belonged to the *Aspergillus flavus-oryzae* group, *Stemphylium*, *Curvularia*, and *Rhizopus* spp. being present in smaller numbers. Only the predominant species survived 34 days' storage to any significant extent, *F.* spp. occurring mainly in the top and *A. flavus-oryzae* in the bottom layer, where the few remaining *P.* spp. (only about 50 per gm. as compared with 25,000 at the beginning of the test) were also found.

Hashioka (Y.) & Ikegami (H.). **The leaf scald of Rice.**—Papers dedicated to Prof. Y. Tochinari and Prof. T. Fukushi for the commemoration of their 60th birthdays, pp. 65–70, 1 pl., 1955. [Japanese, with English summary.]

A new disease known as 'leaf scald' is fairly common on mature leaves of rice plants in Japan. It is caused by a new fungus, *Rhynchosporium oryzae* Hashioka and Yokogi (with a Latin diagnosis), the conidia of which are not obliquely beaked but slightly curved and easily distinguishable from those of *R. secalis* and *R. orthosporum*. *R. oryzae* grows well at temperatures ranging from 20° to 27° C., with an optimum at 20°, so that the disease may well occur even in mountainous regions. Leaf scald tends to be serious on plants receiving excessive quantities of nitrogen. On unwounded leaves the typical symptoms develop mostly at the tip of the lamina; on seedlings the only effects are an apical stramineous blight and a dark browning at the leaf sheath.

Bugnicourt (F.). **Deux espèces nouvelles d'Helminthosporium isolées de semences de Riz.** [Two new species of *Helminthosporium* isolated from Rice seeds.]—*Rev. gén. Bot.*, 62, 734, pp. 238–243, 3 figs., 1955.

Two new species of *Helminthosporium* occurring on rice grain in the South

Pacific region [cf. *R.A.M.*, 32, p. 449] are described [without Latin diagnoses]. *H. hawaiiense* was first isolated from material from Hawaii in April, 1950, and subsequently from Papua, Dutch and Australian New Guinea, Borneo, and New South Wales. On maize meal agar the conidiophores of the Papua strain isolated from the Mekeo 1 variety were brown, simple, markedly geniculate, and measured 54 to 170 by 3·2 to 3·9 μ and the conidia 19 to 51 by 6·1 to 9·9 μ. Conidiophores produced on inoculated rice leaves measured 55 to 140 by 3·6 to 4·9 μ with a bulbous base.

H. australiense, isolated in January, 1951, from grains of the Giros variety from Yako Experiment Station, New South Wales, had markedly geniculate conidiophores 56 to 135 by 3·3 to 4·9 μ (5·6 in the geniculate part) and conidia measuring 15 to 39 by 6·6 to 10 μ (average of two- to seven-septate conidia on three different media).

Influence of environment on the chemical composition of plants. I. A review of the literature.—*Bull. sth. co-op. Ser., U.S. Dep. Agric.*, 36, 198 pp., 7 graphs, 1954.

Of special interest to plant pathologists in this useful survey of the literature on environmental influence on the chemical composition of plants, contributed by six agricultural experiment stations in co-operation with the U.S. Plant, Soil and Nutrition Laboratory, Ithaca, New York, and the Weather Bureau, U.S. Department of Commerce, are the chapters dealing with the relation of this factor to (*a*) the calcium content by W. J. Peterson and H. F. Krackenberger (North Carolina, pp. 77–97); (*b*) the magnesium content by the same authors (pp. 98–118); (*c*) the potassium and sodium contents by E. V. Miller and T. J. Army (North Carolina, pp. 118–154); the iron content by Mary J. Speirs (Georgia, pp. 155–175); and the micronutrient elements by K. C. Beeson (U.S. Plant, Soil and Nutrition Laboratory, pp. 175–198).

Georlette (R.). **Résultats des plus récentes recherches sur l'action de l'élément sodium et des éléments mineurs contenus dans le nitrate du Chili.** [The results of the most recent studies on the effect of the sodium and minor elements in Chilean nitrate.]—*Ann. Gembl.*, 59, 2, pp. 73–126, 1953.

This is an annotated review of the principal publications (370 titles) appearing from 1949 to 1951, inclusive, dealing with the role, in plant and animal nutrition and in soils, of sodium and the minor elements present in Chilean nitrate [see next abstract], i.e., magnesium, boron, manganese, molybdenum, copper, zinc, iron, iodine, arsenic, and cobalt.

Bibliography of the literature on the minor elements and their relation to plant and animal nutrition. Fourth edition, volume III.—117 pp., Chilean Nitrate Educational Bureau, Inc., 120 Broadway, New York, 1953. [Received May, 1954.]

The third volume of this edition [cf. *R.A.M.*, 31, p. 253], containing 1,000 abstracts, includes material published from January, 1951, to December, 1952.

Ruck (H. C.) & Gregory (F. G.). **Mobility of manganese, magnesium and potassium in leaf tissues.**—*Nature, Lond.*, 175, 4452, pp. 378–379, 1 fig., 1955.

At the Research Institute of Plant Physiology, Imperial College of Science and Technology, London, the mobility of metallic elements from fully active leaves was studied by detaching leaves with axillary buds from potato plants grown in sand culture supplied with nutrient solutions and rooting them in sand or an appropriate solution. When the bud grew into a shoot, one leaflet of each pair was removed and analysed. In solutions deficient in a particular element the axillary shoot developed deficiency symptoms and when these were marked the opposite leaflet of the pair

was then analysed. The mean values (in μgm.) obtained for the distal pair of leaflets were: manganese (12 leaflets) 2·56 and 2·46; magnesium (10) 116 and 106; and potassium (10) 420 and 360.

The use of high and low manganese and magnesium solutions demonstrated that neither element was readily transported from the active leaf to the growing bud. With potassium, however, leaflets from cuttings in a normal solution contained 264 μgm. at the start of the experiment and 673 after 42 days and those without potassium 276 and 164. Thus, the potassium content of the subtending leaf fell considerably and deficiency symptoms developed in both it and the axillary shoot.

Weber (Anna). **Magnesiummangel. I. Forsøg og undersøgelser med Tomat, Selleri og Kartoffel m.m. 1948–53.** [Magnesium deficiency. I. Experiments and investigations with Tomato, Celeriac, and Potato, etc., 1948 to 1953.]—*Tidsskr. Planteavl*, 58, 3, pp. 421–462, 4 figs., 1 graph, 1955. [English summary.]

Since 1920 the experimental field at the Danish State Research Station has been supplied almost exclusively with synthetic fertilizers, resulting in high phosphorus and potassium levels and a high pH, accompanied by a low content of available magnesium. In 1946 tomatoes growing in this soil were observed for the first time to show symptoms of magnesium deficiency [*R.A.M.*, 27, p. 49 *et passim*], expressed by marginal and apical chlorosis of the leaves, progressing from the base upwards, and poor growth. From 1951 to 1953 very satisfactory control was obtained by spraying five times with 5 or 3 per cent. magnesium sulphate between early June and mid-August. A month's delay in beginning the treatments reduced their efficacy. An improvement in the condition of the plants, though not so noticeable as that secured by spraying, was also effected by watering the soil with a 5 per cent. solution of the compound at the rate of 1,000 kg. per ha. Similar treatments were applied to celeriac, which reacted to the deficiency by a yellow, later pinkish discoloration of the leaf margins, with beneficial results. Five applications at 5 per cent. from mid-June to mid-August also gave partial control of the foliar chlorosis and interveinal necrotic spotting of Alpha potatoes induced by magnesium deficiency. The effect of the magnesium sulphate soil amendments was transient, persisting only to a slight extent in the following year's tomato crops and exerting no further influence on potato.

In 1953 acute symptoms of magnesium and potassium deficiency [28, p. 158] were observed in Alpha potatoes grown in soil which had been used since 1910 for manurial experiments, at first in the field and subsequently in cement pipes. Magnesium deficiency symptoms occurred in all the pipes with added potassium, being mildest where nitrogen was the only other supplement.

The injection of 0·5 per cent. magnesium sulphate into the petioles by Roach's method [13, p. 641] prevented the development of deficiency symptoms in tomato, celeriac, and potato.

Cox's Orange Pippin apple trees affected by magnesium deficiency responded favourably to five sprayings with 2 per cent. magnesium sulphate at 10- to 15-day intervals from 7th June. On the untreated trees the lower leaves of the long summer shoots developed interveinal brown spotting, followed by defoliation.

Hudson (W. J.) & Cradock (F.). **Major and minor elements: deficiencies in pastures and crops in New South Wales.**—*Agric. Gaz. N.S.W.*, 64, 10, pp. 523–527; 11, pp. 597–599, 2 col. pl., 1 map, 1953.

This further contribution [cf. *R.A.M.*, 34, p. 318] is concerned with the role of molybdenum [loc. cit.], boron, manganese, copper, zinc, and iron in the nutrition of pastures and miscellaneous crops in New South Wales with notes on the incidence and symptoms of deficiencies in these elements. In most cases the deficiencies

can be remedied by the appropriate soil amendments, but zinc is best applied as a spray.

The final instalment concerns the determination of deficiencies in field plots by applying combinations of all the necessary elements, omitting one from each plot and sowing with a pasture seed mixture containing at least one legume. The distribution of deficiencies of molybdenum, boron, sulphur, copper, and zinc in the State is illustrated by a map.

ROLL-HANSEN (J.). **Problemer vedrörende damping av jord.** [Problems connected with the steaming of soil.]—*Nord. JordbrForskn.*, 36, pp. 283–288, 1 fig., 1954.

Problems connected with steam sterilization of horticultural soils are briefly discussed with special reference to Norwegian conditions. They include methods of production; different types of apparatus to ensure diffusion of steam through the soil; whether the soil should be flooded after steaming; reasons for the increased yields produced by the treatment, with special reference to the control of cork [brown root] rot [? *Cylindrocarpon radicicola*], the most important disease of tomatoes in Norway at present [*R.A.M.*, 32, p. 516]; and the changes in the assimilation of nutrients induced by steaming.

Control of serious diseases of foot rot and leaf spot of Pan crop.—*Agric. Anim. Husb., Uttar Pradesh*, 5, 2, pp. 8–10, 3 figs., 1954.

In October, 1950, foot rot and leaf spot of pan [*Piper betle*] caused by *Rhizoctonia* [*Corticium solani*: *R.A.M.*, 28, p. 591] and *Phytophthora parasitica* [var. *piperina*: loc. cit.] were observed for the first time in Banaras and Mirzapur, Uttar Pradesh, India, and subsequently progressed to such an extent that the cultivation of the crop was abandoned in many areas. The use of Bordeaux mixture (5-5-50) or 0·25 per cent. perenox, sprayed on both the vines and soil achieves control.

SINGH (D.). **Castor—its genetics, breeding and culture.** *Agric. Anim. Husb., Uttar Pradesh*, 5, 4, pp. 3–36, 8 figs., 2 diags., 1954.

Most of the information in the disease section (pp. 28–30) of this paper on castor bean (*Ricinus communis*) its origin, history, and cultivation in general and in India has already been noticed from time to time in this *Review*.

GUPTA (J. S.). **Disease appraisal of stem-gall of Coriandrum sativum L.**—*Indian Phytopath.*, 7, 1, pp. 53–60, 1954.

During 1952–3 a disease survey and crop loss estimate was made of the stem-gall disease of *Coriandrum sativum* caused by *Protomyces macrosporus* [*R.A.M.*, 11, p. 73] in a field near Gwalior, India, where the disease is prevalent. A hundred mature plants were selected at random and the growth, disease intensity, and yield recorded at Agra College, and an attempt was made to establish an index for the visual appraisal of symptoms. Scores of 40, 20, and 40 points, respectively, were given for fully diseased main stem, pedicels, and fruits. The scoring for the stem depended on the extent and density of tumours, for pedicels on the length diseased, and for fruits on the proportion diseased. A plant free from symptoms scored a total of three [4, p. 423]. As the field was almost completely infected the loss percentage was calculated by dividing the actual yield by the expected yield and multiplying by 100.

The average loss of yield per plant was estimated to be about 15 per cent. and the mean total disease intensity at 23 per cent.

LASRADO (E. A.). **Suggestions for future research on the spike disease of Sandal.**—*Indian For.*, 81, 4, pp. 282–285, 1955.

In a review of the research results so far obtained on the spike virus disease of

sandal (*Santalum album*) [*R.A.M.*, 34, p. 255], which is epiphytotic in the Salem North and Vellore West divisions of Madras, India, and is also present in Coimbatore North, Kollegal, Vellore East, and the Nilgiris, the author concludes that all control measures yet attempted have been unsuccessful. It is proposed to encourage the cultivation of sandal in new areas with a similar climate to that of the North Coimbatore Hills, and transfer cultivation from State ownership to the private cultivator. The development of resistant varieties would appear to be the most promising line for future research.

Chu (H. T.). **Sclerospora leaf split and grain smut in Cane variety N: Co 310 in Taiwan.**—*Rep. Taiwan Sug. Exp. Sta.* 10, pp. 113–122, 9 figs., 1953. [Chinese, with English summary.]

A rare disease of sugar-cane, leaf split, caused by *Sclerospora miscanthi* [cf. *R.A.M.*, 9, p. 250] was found in Formosa in July 1953 for the first time since 1922. The symptoms on the leaves of the variety N: Co 310 were at first narrow, greenish-yellow streaks, changing in colour with age to yellow, reddish-brown, and dark red, and they finally withered and split longitudinally. On the under surface were formed conidiophores, 97 to 300 (438) μ by 12 to 37 μ, branched dichotomously at the tips, and bearing 20 or more oval conidia 37·2 to 48·6 by 14·3 to 22·9 μ, averaging 41·8 by 18 μ. Conidia formed in the laboratory were somewhat smaller; they germinated by tubes. The size of the oospores, 32·4 to 56·7 μ, with a mean diameter of 47·1 μ, compares well with previously recorded measurements of 40 to 56 μ.

Infected plants produced large numbers of oospores in the split leaves, were stunted, and died. From experimental results it was concluded that the disease was transmissible by soil-borne oospores, and that only the thinner cane varieties such as N: Co 310 and Co. X are susceptible. Complete control was obtained by placing diseased cuttings in water at 46° C. for 20 minutes and then at 52° for 20 minutes.

Another rare sugar-cane disease, grain smut (*Sphacelotheca saccharicola*), was found in January, 1953 in Formosa, for the first time since 1919. This smut differed materially from *S. cruenta* but might be similar to *S. sacchari*, with which it has not been compared.

Liu (H. P.) & Li (H. W.). **Studies on the Sugarcane mosaic virus in Taiwan. Part II. The mode of resistance of Cane varieties and the wild relatives of Cane to strains of mosaic.**—*Rep. Taiwan Sug. Exp. Sta.* 10, pp. 89–103, 1 fig., 1953. [English and Chinese summaries.]

In further studies on sugar-cane mosaic virus in Formosa [cf. *R.A.M.*, 30, p. 545] several species of *Saccharum* were inoculated with the short-stripe (SS), yellow-stripe (YS), and fine-stripe (FS) strains of the virus [loc. cit.]. *S. officinarum* and *S. robustum* were susceptible to all three strains, and *S. spontaneum* immune. Two varieties of *S. barberi* were susceptible to SS and YS and immune from FS, while *S. sinense* was immune from SS and YS but susceptible to FS.

Resistance to strains SS and YS, originating from the variety Glagah, and to FS from *S. barberi* is dominant, while that from *S. sinense* appears to be recessive.

Robertson (J. S.). **Leaf scald investigation.**—*Sug. Bull., Georgetown*, 21, pp. 61–62, 1953.

Outbreaks of leaf scald on sugar-cane in British Guiana [*R.A.M.*, 31, p. 144] were severe during 1952, occurring on the varieties B. 37161, B. 41227, B. 4362 and D. 62/43. The only resistant commercial variety is B. 4098. Out of 27 canes imported from Barbados, eight were resistant to leaf scald, namely, B. 37254, B. 4454, 28 N.G. 7, Dacca, Tobongo, Kloet, Pasoeroean, and Local, and the varieties B. 39250, B. 39254, B. 39274, B. 41242, 32 M.Q. 579, and Kavangire were

tolerant. In varietal resistance trials at the Sugar Experiment Station, out of 143 varieties under test 19 failed to show any symptoms, 27 were resistant, and 34 tolerant.

It has been proved that rats are responsible for the spread of leaf scald, and that infection does not occur by root contact, through the soil or undamaged buds. The disease causes a suppression of growth up to 50 per cent. of that of the controls, and yield losses of 35 to 40 per cent. The organism responsible for leaf scald of sugar-cane in British Guiana closely resembles *X. albilineans*.

Hughes (C. G.). **The diseases of Saccharum in New Guinea.**—*Tech. Commun. Bur. Sug. Exp. Stas. Qd*, 1, 21 pp., 8 figs., 1953.

During a cane-collecting expedition to New Guinea in April–May, 1951, organised by the Bureau of Sugar Experiment Stations, Queensland, 165 new varieties were found. Among the diseases collected were six which had already been recorded, namely, downy mildew (*Sclerospora* sp.); eye spot (*Helminthosporium sacchari*); yellow spot (*Cercospora koepkei*); pokkah boeng (*Gibberella fujikuroi*); Fiji [virus] disease; and mosaic. New records for New Guinea found on this trip were rind disease (*Pleocyta sacchari*), red rot (*Physalospora* [*Glomerella*] *tucumanensis*), rust (*Puccinia kuehnii*), *Schizophyllum commune*, *Sclerotium rolfsii*, and banded sclerotial disease of unknown origin. Four new diseases were seen, a red-brown striping of the leaves of noble canes growing in all highland localities, which may have been caused by low temperatures, 'pustular disease' apparently due to an unidentified fungus on leaves in coastal areas, a small leaf spot associated with *Helminthosporium* sp., and a (?) bacterial streaking of leaves.

Orian (G.). **La maladie des stries chlorotiques de la Canne à Sucre.** [Sugar-Cane chlorotic streak disease.]—*Rev. agric. Maurice*, 32, 3, pp. 115–120, 1 pl., 1953.

Notes are given on the history, cause, symptoms, and control of sugar-cane chlorotic streak [*R.A.M.*, 32, p. 614] in Mauritius. In badly drained areas with high rainfall and other unfavourable environments the disease can cause as much as 30 to 40 per cent. loss in yield. Most of the varieties grown locally are susceptible, but B. 37161 appears to be resistant and B. 3337 might possibly be grown in the central plateau area. Field and nursery inspection and destruction of diseased shoots are essential for the control of the disease. Hot water treatments [27, p. 45] are recommended for large plantations while field sanitation might be more profitable for the smaller ones.

Corner (E. J. H.). **The construction of Polypores. I. Introduction : Polyporus sulphureus, P. squamosus, P. betulinus and Polystictus microcyclus.**—*Phytomorphology*, 3, 3, pp. 152–167, 13 figs., 1953. [Received May, 1955.]

Following an illustrated re-definition of the terms monomitic, dimitic, and trimitic, as applied to hyphal structure in the Polyporaceae [*R.A.M.*, 26, p. 566], the author distinguishes two kinds of dimitic construction, one with skeletal and the other with binding hyphae. The latter corresponds to Cunningham's dimitic structure with 'bovista' hyphae [loc. cit.], and it is shown that these are not skeletal hyphae but binding hyphae of limited growth. In studies at the Botany School, Cambridge, *Polyporus sulphureus*, *P. squamosus*, and *P. betulinus* were found to be dimitic with binding hyphae in the flesh, but they differ in the pore partitions being monomitic, dimitic with binding hyphae, and dimitic with skeletal hyphae, respectively. *Polystictus microcyclus* is monomitic with rapidly thickening hyphal walls.

Iaconis (Celina L.) & Wright (J. E.). **Estudios sobre Basidiomycetes II. Sistematica y biologia de tres especies de Fomes.** [Studies on Basidiomycetes. II.

Systematics and biology of three species of *Fomes*.]—*An. Soc. cient. Argent.*, 155, 5, pp. 106–116; 6, pp. 134–143; 156, 1, pp. 10–24, 3 pl., 6 figs., 1953.

In the course of revision of the Polyporaceae of north-eastern Argentina [cf. *R.A.M.*, 22, p. 328] a detailed study was made of three species of *Fomes* causing rots of living trees. The first part comprises a description of the materials and methods employed, with particular regard to terminology; the second their descriptions in nature and in culture. A key for their identification is provided.

F. pseudosenex is distinguished from *F. fastuosus* by the deeper yellow context and from *F. rhabarbarinus* by the absence of setae. The specimen studied caused rotting of living *Peltophorum dubium* at Misiones. *F. dependens*, occurring on *Caesalpinia melanocarpa*, is very similar macroscopically to various species including *F. igniarius*. It is distinguished by the absence of setae and the intense colour and size of the spores, and is confined to tropical America, extending to southern Brazil and northern Argentina. The type of *F. chaquensis* n.sp. was found on an unidentified host, but the fungus also occurred on *Schinopsis balansae*, *Caesalpinia melanocarpa*, and *Astronium balansae* in various localities in Argentina. The pileus has a black, rimose surface, is quasi-cinereous, and deeply fissured at the margin. The tubules are dark chestnut, the pores cinnamon, 5 to 8 mm. with abundant setae, and the spores chestnut coloured with a thick epispore and measure 3·9 to 5·2 by 4·5 to 6·5 μ. The chestnut setae measure 5·2 to 6·5 by 13 to 20 μ. Colourless prismatic crystals were enclosed between the pseudoparenchymatous hyphae. A bibliography of 83 titles is appended.

Baldacci (E.), Spalla (C.), & Grein (A.). **The classification of the Actinomyces species (= Streptomyces).**—*Arch. Mikrobiol.*, 20, 4, pp. 347–357, 1954. [Italian summary.]

A system of classification of the Actinomycetes [*R.A.M.*, 34, p. 262] is presented, supplementary to the provisional one published in *R.C. Ist sup. Sanit., 1953*, pp. 20–39, 1953. It is founded on the formation of 'series', comparable with those of other groups of fungi, such as *Penicillium*, *Aspergillus*, and *Fusarium*, defined on the basis of colony and cultural characters, with special reference to the colour of the vegetative and aerial mycelium, these features having proved to be more constant than the pigmentation of the medium. A list is given of some of the better-known species of *Actinomyces* grouped in their appropriate series, and the paper concludes with specifications for culture media and laboratory methods.

Annual Administration Report for 1953–1954 of the Scientific Department (Tea Section) of the United Planters' Association of Southern India.—24 pp. [1954].

In the Research and Advisory Section (pp. 3–7) of this report [cf. *R.A.M.*, 34, p. 66] it is stated by P. De Jong that 11 fungicides were screened from August to December, 1953, for use against blister blight of tea [*Exobasidium vexans*: 34, p. 263], by means of a new half-bush technique, each half receiving a different treatment. The dusts were applied at about 13 lb. per acre and the sprays at 20 gals. per acre initially, increasing to about 40 gals. at some stages owing to nozzle wear. The most effective formulations, based on the average percentage infections on the shoot and third leaf, were perenox (1 in 400) alone (9·95 and 8·8) and with adhesive YF. 2732 (9·9 and 6), colloidal copper at the same strength (10·15 and 6·95), 1 in 40 fernasul (10·8 and 10·05), and I.C.I. 6 per cent. copper dust YF. 3105 (8·15 and 4·45), the figures for the unsprayed being 27·2 and 33·95. It is of note that the colloidal copper formulation contained only 15 per cent. metallic copper. Fernasul caused some scorching of the young leaves.

The report of the Botanist (K. S. Venkataramani, pp. 17–21) includes the following items. Branch canker caused by *Macrophoma theicola* [34, p. 66] was

reported from several estates, and a collar rot of young plants apparently due to environmental factors. The most common root diseases of tea were brown root rot (*Fomes noxius*) and red root rot (*Poria hypolateritia*). Black root rot (*Rosellinia arcuata*) [loc. cit.] was reported from a high-elevation estate on the Nilgiris and *Cylindrocladium* [31, p. 461] was observed on a few young tea plants from the Nilgiri-Wynaad.

Shell DD soil fumigant completely suppressed the growth of *F. noxius* and *Armillaria mellea* in pure culture after 24 hours' exposure and after 14 hours in the case of *Cylindrocladium*. A confirmatory test was conducted using root fragments inoculated with *F. noxius* buried in glass jars in DD-fumigated sterilized and unsterilized soil. One month later the root fragments were plated out on potato dextrose agar. Most of the roots from unsterilized, fumigated soil yielded *Trichoderma viride*, *Fusarium*, and *Penicillium* but not *F. noxius*. Nine out of ten roots from sterilized, untreated soil, and eight from sterilized, fumigated soil yielded *F. noxius*.

Adequate protection against leaf fall of rubber due to *Phytophthora palmivora* [28, p. 195] was obtained in a pilot trial on a 40-acre field with three applications of 6 per cent. cuprosana dust at 16 lb. per acre, given as near the monsoon as possible depending on the prevailing weather conditions.

Schramm (G.), Schumacher (G.), & Zillig (W.). **An infectious nucleoprotein from Tobacco mosaic virus.** *Nature, Lond.*, 175, 4456, pp. 549–550, 3 figs., 1955.

Further studies on the degradation of tobacco mosaic virus at the Max-Planck Institute for Virus Research, Tübingen, Germany, were concerned with fractionating the products by electrophoresis and isolating each fraction for study [*R.A.M.*, 33, p. 763]. Fraction I contained 90 per cent. ribonucleic acid and 10 per cent. protein, the sedimentation constant indicating a high molecular weight. Fractions I and II contained more ribonucleic acid than the original virus, and ultracentrifuging revealed several definite components with lower sedimentation constants. Fraction III was identical with the original virus in ribonucleic acid content, mobility, and sedimentation constant but included a small amount of material of lower molecular weight. Fraction IV was identical in all its properties with a natural by-product of virus reproduction isolated from virus-infected plants by Takahashi's method [32, p. 346].

After prolonged exposure to pH 10·3 nucleo-proteins I and II were converted into ribonucleic acid and protein IV. Fraction III, however, did not disintegrate even after several months at pH 10·5 and is termed the 'stable fraction' to distinguish it from the 'labile fractions'. Different preparations of normal tobacco mosaic virus all contained 30 per cent. of III, but the Dahlemense strain only 12 per cent. At first both the stable and labile fractions were highly infectious in local lesion tests on *Nicotiana glutinosa* and *Phaseolus* [*vulgaris*] whereas nu[cleic acid] and fraction IV were not, though after prolonged treatment all the components were inactivated. Centrifugation of fractions I plus II at 25,000 r.p.m. yielded a fraction of high molecular weight, possessing almost the same infectivity per mg. protein nitrogen as the original virus but quite distinct in its properties.

The suggestion is made that the virus particle consists of a series of protein disks 70 Å in diameter strung on a thread of ribonucleic acid.

Marcelli (E.). **Un virus necrotico isolato da piante di Tabacco affette da mosaico.** [A necrotizing virus isolated from Tobacco plants affected by mosaic.] — *Tabacco, Roma*, 57, 644, pp. 83–92, 4 figs., 1953.

At the Scafati section of the Experimental Scientific Institute for Tobacco, Italy, sap from the roots of Virginia Bright and Perustitza tobacco plants affected by

tobacco mosaic virus was inoculated into the leaves of plants of the same varieties by rubbing with carborundum. After only two days necrotic spots appeared on leaves inoculated with sap from the Perustitza plants, though the latter had shown no evidence of leaf necrosis. After four days the spots were 4 to 5 mm. in diameter. Two kinds were present: one consisted mainly of concentric, necrotic zones with a dark, sometimes scarcely visible halo, the other of smaller, paler, necrotic spots, sometimes with healthy, darker tissue in the centre and with a conspicuous, brownish halo. *Datura stramonium* and certain other inoculated hosts also developed this second type of spot, which resembled that described by Fulton as due to a mutant of tobacco necrosis virus [*R.A.M.*, 31, p. 516].

Inoculations gave positive results on Virginia Bright, White Burley, Samsun, Erzegovina, and Maryland tobacco, *Nicotiana rustica*, *N. glutinosa*, *Solanum nigrum*, cucumber, cowpea, zinnia, groundnut, clover, squash, and *Phaseolus vulgaris*. Apart from the immunity of beet and rye, previously reported to be susceptible [cf. 16, p. 418; 18, p. 211], the author's virus appears very similar to the tobacco necrosis viruses described by other workers, especially Price [loc. cit.] and Bode [28, p. 550].

The virus was inactivated at a temperature between 62° and 64° C.; the dilution limit was between 1 in 5,000 and 1 in 6,000.

SOBEY (W. R.). **The inheritance of antibody response to Tobacco mosaic virus in Rabbits.**—*Aust. J. biol. Sci.*, 7, 1, pp. 111–117, 4 graphs, 1954.

Studies at the Animal Genetics Unit, C.S.I.R.O., University of Sydney, Australia, demonstrated that in a cross-bred population of rabbits the level of secondary antibody response to a routine injection of tobacco mosaic virus was highly heritable.

PUZZILLI (M.). **Osservazioni sugli ibridi di prima generazione ottenuti tra le linee americane resistenti al mosaico e la linea Italia di Virginia Bright.** [Observations on the hybrids of the first generation obtained between the American lines resistant to mosaic and the Italia line of Virginia Bright.]—*Tabacco, Roma*, 57, 648, pp. 207–216, 6 figs., 1953.

In breeding experiments at the Botanical Institute, University of Perugia, Italy, to transfer resistance to tobacco mosaic virus [cf. *R.A.M.*, 33, p. 452] from the American lines Ky 52, Ky 56, Ky 151, Ky 160, and Nn_2 a_1 a_2 a_2 to the Italia line of Virginia Bright the F_1 of the crosses between these lines was phenotypically similar to Virginia Bright. The leaf, however, was unsuitable, and the same F_1 was re-crossed with line A no. 16 of Virginia Bright. F_2 29, 30, 33 and 37 gave the same reaction to inoculation with mosaic virus as Ky 56, the plants developing localized necroses but no systemic infection. In further transmissions, however, only plants inoculated with sap from F_2 37 and from Ky 56 remained free from mosaic; F_2 29, 30, and 33 transmitted the virus and should therefore be regarded as symptomless carriers.

SEMPIO (C.) & LUCACCI (G.). **Lotta contro l'oidio del Tabacco.** [Control of *Oidium* of Tobacco.]—*Tabacco, Roma*, 57, 643, pp. 45–55, 1953. [English summary.]

In an experiment on the control of tobacco *Oidium* [*Erysiphe cichoracearum*: *R.A.M.*, 32, p. 593 and following abstracts] five rows of Virginia Bright plants growing at Tevere, Casalina, central Italy, were treated on 5th August, 1952, with sulphur dust, applied to the soil at the rate of 100 kg. per ha. with a knapsack duster. The next four rows remained untreated and the five after were treated with activated sulphur containing 10 per cent. lamp-black. The disease appeared on 30th August, and the treatments were repeated. On 10th September the plants had respectively, 1 to 2, 3 to 4, and 1 to 2 per cent. infection, compared with 95 per

cent. in the rest of the plot (untreated). Good control with activated sulphur was reported by other workers from different parts of Italy.

The first application, in central Italy, should be made towards the end of July or early in August, 100 to 120 kg. per ha. of sulphur with 10 per cent. of lamp-black being spread on the ground along alternate rows. Further applications should be made after irrigation or heavy rain: one during the second half of August is advisable and, in very hot, dry localities, one in September. The method is suitable for use only in hot weather and on sunny plots where the foliage is dense enough to prevent the vapour from dispersing.

Lucacci (G.) & D'Armini (M.). **Lotta contro l'oidio del Tabacco con prodotti solforati a dose ridotta.** [Control of *Oidium* of Tobacco with sulphurated products at a reduced dosage.] — *Tabacco, Roma*, 57, 651, pp. 354–357, 1953.

In experiments on the control of tobacco *Oidium* [*Erysiphe cichoracearum*: see preceding and next abstracts] Virginia Bright plants near Tevere, Italy, sprayed with colloidal sulphur V.P. at percentages ranging from 1·5 (the usual dosage) to 0·1, developed, on 28th September, 1951, slight infection or none, as compared with severe infection on the untreated. In 1952, the best results (trace of infection only, as compared with severe infection in the controls) in the ranges of concentration tested were given by sulphur V.P. at 0·3 to 0·4 per cent. and calcium polysulphide at 0·2 to 0·3 per cent. All the treated leaves retained a normal or improved aroma.

These treatments are suitable for use on tobacco varieties which do not cover the soil satisfactorily, and in years when the summer is cool and damp (cf. preceding abstract). An initial application should be made during the first fortnight of August: a knapsack sprayer may be used, and only the upper surfaces of the leaves need be treated. The treatment should be repeated at the first signs of infection and after heavy and persistent rain.

D'Armini (M.). **Esperienze di endoprevenzione condotte con carbonato di litio contro l'oidio del Tabacco.** [Experiments on endoprevention conducted with lithium carbonate against *Oidium* of Tobacco.] — *Tabacco, Roma*, 57, 649–650, pp. 319–323, 2 figs., 1953.

In a greenhouse experiment at the Institute of Plant Pathology, Faculty of Agriculture, Perugia, Italy, Virginia Bright 5 tobacco seedlings in 10 to 11 l. pots were treated with lithium carbonate at 1·37 and 0·685 per cent., each concentration at 500 and 1,000 ml. per pot, sprinkled [? on the soil] in three applications at two-day intervals, starting when the seedlings had recovered from the effects of transplanting and averaged 20 cm. in height. One pot was left untreated. Two days after the final treatment the plants were inoculated with *Oidium* [*Erysiphe cichoracearum*: *R.A.M.*, 31, p. 461 and preceding abstracts]. All the treatments reduced the number of infected plants, but marked leaf burning developed, particularly with the higher concentration and volume, and in three months the treated plants had died off almost completely.

In view of these results and those obtained by earlier workers [30, p. 633; 31, p. 461], the author concludes that lithium carbonate is active against *E. cichoracearum*, but the optimum dosage is easily exceeded or not reached, the quantity and quality of the treated soil in relation to dosage being of prime importance.

Gigante (R.). **Un marciume radicale causato da Thielaviopsis nei semenzai di Tabacco del Leccese.** [A root rot caused by *Thielaviopsis* in Tobacco seed-beds in Lecce.] *Tabacco, Roma*, 58, 656, pp. 71–83, 3 figs., 1954.

In May, 1953, tobacco seed-beds in the Province of Lecce, Italy, were affected, apparently for the first time, by black root rot (*Thielaviopsis basicola*) [*R.A.M.*, 16, p. 130; 27, p. 543]. In some beds the plants were completely destroyed, while

in others they appeared stunted, wilted, and yellow. Losses were greatest among plants given a heavy application of stable manure in addition to nitrogenous fertilizers, among those thickly sown, and among those growing in places that remained very wet after the heavy rains that fell during the season. The Erzegovina variety was highly susceptible.

Preventive measures [16, p. 130; cf. 31, p. 249; 32, p. 516] include sowing (Levantine varieties) at the rate of not more than 0·5 gm. of seed per sq. m.; the seed should be mixed with ashes or sand to ensure even distribution. The beds must be adequately drained, and the plants should be aired by removing the covers from time to time. Gauze coverings are preferable to glass. Heavy applications of manure should be avoided, but potassium nitrate is recommended as it stimulates root production and increases resistance. If the disease appears, the infected plants should be removed and the soil disinfected with ferrous sulphate (10 to 15 per cent.) or formalin. Infested soil should be sterilized before replanting.

Liccori (O.). **Alterazione non parassitaria su fusti di Bright Italia.** [Non-parasitic injury on stems of Bright Italia.] *Tabacco, Roma*, 57, 647, pp. 183–202, 11 figs., 1953. [English summary.]

In 1952, Bright Italia tobacco plants growing near Lecce, Italy, bore longitudinal cracks on the stems, extending between two leaves on the same perpendicular. The condition is attributed to unfavourable physical and mechanical soil factors. The soil was a heavy, easily water-logged clay and the resultant disequilibrium between water absorption and transpiration caused cracking of the stems at points of weak mechanical resistance. It is suggested that the plants should be given smaller but more frequent irrigations, especially in the early stages of growth.

Macrae (N. A.). **Progress Report 1949–1953, Central Experimental Farm, Tobacco Division, Ottawa, Canada.**—43 pp., 6 figs., 4 graphs, 1955.

In the section on varietal improvement (pp. 24–31) of this report [cf. *R.A.M.*, 29, p. 437], F. H. White states that Nicot's nicotine-free strain 706 is highly resistant to black root rot (*Thielaviopsis basicola*) [32, p. 667] and brown root rot [due to nematodes: 34, p. 405], resistance to both diseases being inherited as a simple dominant. *Nicotiana debneyi* [33, p. 119] is apparently immune from *T. basicola* and has been introduced into the breeding programme. Three selections from the Greenwood variety, resistant to *T. basicola*, have been made since 1948.

In breeding for resistance to tobacco mosaic virus [loc. cit.; 29, p. 437] during the period under review 430 plant progenies were examined for resistance, nearly two thirds being inoculated each year. Only 5 to 6 per cent. of the F_2 progeny showed any resistance. Of the flue-cured varieties the most recent selections are resistant and are approaching desirable cultural characteristics.

The most satisfactory mosaic resistant Burley strains were those involving Harrow Velvet [loc. cit.]. In 1951 NN Haronova, resistant to black root rot, was used to introduce the dominant type of mosaic resistance. A number of lines carrying both types of resistance are promising.

In yield and quality studies in 1953 with cigar varieties the best mosaic resistant strains yielded significantly less than the commercial variety Havana 211 in the absence of mosaic infection.

Anderson (P. J.). **Growing Tobacco in Connecticut.** *Bull. Conn. agric. Exp. Sta.* 564, 110 pp., 36 figs., 1 map, 1953. [Received 1955.]

On pp. 57–81 of this Bulletin the author describes the symptoms and control of the principal diseases of tobacco in Connecticut in the order in which they occur, viz., in the seed-bed, field, and curing shed [*R.A.M.*, 29, p. 585]. A key for their identification is provided.

Zähner (H.). **Uber den Einfluß der Ernährung auf die Toxinempfindlichkeit von Tomatenpflanzen** [On the influence of nutrition on the sensitivity to toxins of Tomato plants.]—*Phytopath. Z.*, 23, 1, pp. 49–88, 5 figs., 10 graphs, 1955.

In further experiments in the current series of studies at the Federal Technical Institute, Zürich, Switzerland, on wilt diseases of plants, sensitivity to fusarinic acid [*R.A.M.*, 34, p. 266 and next abstract], and in a lesser degree to lycomarasmin and iron-lycomarasmin [30, p. 85], in the Tuckswood tomato variety, which is moderately susceptible to *Fusarium* [*bulbigenum* var.] *lycopersici*, was shown to be determined by nutritional factors. Most sensitive were plants supplied with a complete nutrient solution in the normal proportions, general under- and over-nourishment both tending to reduce susceptibility to the toxins [cf. 28, p. 91], the former through nitrogen deficiency and the latter through a high salt concentration.

Fusarinic acid inhibits respiration in both normally fed and nitrogen-deficient plants, so that resistance to the toxin in the latter case cannot be correlated with a similar reaction in the respiratory system. At a high concentration fusarinic acid also coagulates the protoplasts in both groups. The permeability to water of the protoplasm of plants receiving a balanced nutrient solution is enhanced by the same toxin at a low concentration (1×10^{-3} M) acting for a period of five minutes. Nitrogen-deficient plants are not affected in this way, and their freedom from the necroses developing in the normally fed group is tentatively attributed to the resistance of the protoplasm to increases in permeability caused by fusarinic acid.

Linskens (H. F.). **Der Einfluß der toxigenen Welke auf die Blattausscheidungen der Tomatenpflanze.** [The influence of toxigenic wilting on the leaf secretions of the Tomato plant.]—*Phytopath. Z.*, 23, 1, pp. 89–106, 8 figs., 3 graphs, 1955.

The leaf secretions of Tuckswood tomato plants, measured as a function of the electrolytic resistance of the washing water, were markedly increased by the wilt induced by lycomarasmin and fusarinic acid (toxins of *Fusarium* [*bulbigenum* var. *lycopersici*]) [see preceding abstract]. The process of secretion could be directly followed on the leaf surface, where it was found that the enhancement occurred before the appearance of wilt symptoms and also in areas unaffected by necrosis. The increased secretions contained calcium, potassium, and sodium ions as well as free amino acids. These findings are considered to support the view of Gäumann and Jaag that the primary cause of the irreversible pathological wilting lies in injury to the permeability of the inner layers of the protoplasm [*R.A.M.*, 26, p. 362].

Koek (P. C.). **Een voor Nederland nieuwe bacterieverwelkingsziekte, veroorzaakt door Pseudomonas solanacearum Erw. Smith bij Tomaat.** [A bacterial wilt disease of Tomato, new to Holland, caused by *Pseudomonas solanacearum* Erw. Smith.]—Abs. in *Tijdschr. PlZiekt.*, 61, 1, pp. 20–21, 1955.

In July, 1954, tomato plants were attacked by *Pseudomonas solanacearum* in various localities of western Holland, this being the first record of the pathogen in that part of the country [C.M.I. map No. 138]. Severely diseased plants were also seen for sale here and there in shops. The organism was isolated from infected material and inoculated into healthy plants with positive results.

Hannon (C. I.) & Weber (G. F.). **A leaf spot of Tomato caused by Stemphylium floridanum sp. nov.**—*Phytopathology*, 45, 1, pp. 11–16, 3 figs., 1955.

Stemphylium floridanum n.sp., the agent of a foliar disease of tomato in Florida closely resembling the grey leaf spot caused by *S. solani* [*R.A.M.*, 33, p. 566], is characterized by subhyaline to olivaceous conidiophores, 75 to 300 by 3 to 5·5 μ, with one to seven bulbous swellings, 6 to 8 μ in diameter, spaced at intervals of 15 to 50 μ along their length. A secondary wall is formed in each of the swellings by

the proliferation of the conidiophore after conidial abstriction, imparting a dark coloration [18, p. 141]. The muriform, oblong to cylindrical, subangular, olivaceous or light to dark brown, acrogenous conidia, with one to six (mean two to three) septa, measure 19·9 to 62·2 by 7·6 to 23 μ. They differ from those of *S. callistephi* [30, p. 109] in various features, including their paler colour, roughly verrucose walls, and length to width ratio of 3:1 as compared with 2:1. Moreover, cross-inoculation experiments with the two species gave negative results. The minimum, optimum, and maximum temperatures for the growth of *S. floridanum* in culture are 5°, 26°, and 35° C., respectively, conidial production being most abundant at 23°. A water-soluble, yellow to dark red pigment is produced on potato dextrose agar and other media.

S. floridanum was shown to be pathogenic to the John Baer, Rutgers, and several other tomato varieties, chilli (*Capsicum frutescens*), *Solanum aculeatissimum*, and possibly gladiolus. The infections induced by the fungus develop most readily during the cooler season, i.e., from October to June. After four months' ageing on dried plant refuse, conidia served as an effective source of inoculum in greenhouse and field studies, and they were also capable of causing severe infection after eight months in dried Petri dish cultures.

Krstić (M.). **Nove fitopatološke pojave na šumskim vrstama drveća u našoj zemlji.** [New phytopathological records on forest varieties of trees in our country.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1954*, 22, pp. 3–5, 2 pl. (between pp. 16–17), 1954. [English summary.]

The following forest tree diseases, not previously recorded in Yugoslavia, were observed during a survey of a number of forest nurseries in Serbia in 1953: *Phoma negundinis* on *Acer negundo*, which showed poor resistance to fungus parasites, *Alternaria tenuis* on *Acer platanoides*, *Alternaria brassicae* on *Acer saccharum*, *Cytospora pinastri* on two-year-old seedlings of pine (*Pinus nigra*), *C. chrysosperma* [*Valsa sordida*: cf. *R.A.M.*, 27, p. 590; 33, p. 388] on *Populus pyramidalis*, and *Fusarium blasticola* and *Schizophyllum commune* on *Ailanthus glandulosa*.

Twenty-eighth Annual Report of the Imperial Forestry Institute, 1951–52.—28 pp., University of Oxford, 1953.

In the section on forest pathology (pp. 12–16) of this report, an investigation of the diseases of the eastern American beech (*Fagus grandifolia*) in New England showed that neither infection by *Nectria* [? *coccinea*: cf. *R.A.M.*, 31, p. 91] nor injury by the beech scale, *Cryptococcus fagi*, was responsible for the bark necrosis which was very similar to that on European beech [*F. sylvatica*]. The injury was clearly related to infertile soil. Soil drainage conditions in a forest in New Hampshire were found to affect the incidence of butt-rots [*Fomes* spp., *Stereum* spp., etc.] in red spruce (*Picea rubra*), balsam fir (*Abies balsamea*), and yellow birch (*Betula lutea*).

Work on beech bark necrosis in Bagley Wood, Oxford, has shown that the dying of bark around necrotic areas is a seasonal phenomenon, occurring mostly at the end of the winter. Bark infested by *C. fagi* [cf. 29, p. 483] eventually dies, and is infected by a large number of [unspecified] fungi, which are thought to be surface inhabitants.

Samples of Sitka spruce (*Picea sitchensis*) which had been affected by drought crack in 1947, were received from Aberdeenshire, and all showed general infection of the heart wood with *F. annosus* [cf. 31, p. 262]. A survey indicated that drought crack was associated with the presence of either a shallow soil or a rapidly drying sub-soil.

Riley (C. G.). **Hail damage in forest stands.**—*For. Chron.*, 29, 2, pp. 139–143, 11 figs., 1953.

Seven years after a severe hailstorm near Candle Lake, Saskatchewan, Canada,

stands of mixed white spruce (*Picea glauca*), aspen (*Populus tremuloides*), and jack pine (*Pinus banksiana*), showed characteristic symptoms of hail damage. These included dead trees, particularly jack pine, dead tops, and open and healed wounds, all on the same side of the trees. Internal scars, originating on the growth ring of the year of injury, continue year by year as permanent blemishes in the timber.

Ciferri (R.) & Baldacci (E.). **Le malattie crittogamiche e disfunzionali del Pioppo (Populus spp.).** [Cryptogamic and physiological disorders of Poplar (*Populus* spp.).]—Reprinted from *Rapp. Comm. int. Peuplier, 1948*, 88 pp., 1954. [Received 1955.]

In this paper, read at the second meeting of the above congress held in Rome from 20th to 28th April, the authors review, with the aid of the literature, the principal diseases and disorders of poplars in Italy [*R.A.M.*, 30, p. 636] and elsewhere [31, p. 260] up to 1948.

Biraghi (A.). **Notizie sul mal dell'inchiostro del Castagno.** [Notes on ink disease of Chestnut.]—*Monti e Boschi*, 4, 3, pp. 106–109, 4 figs., 1953. [French and English summaries. Received May, 1955.]

The author briefly reviews and discusses the history of research into chestnut ink disease (*Phytophthora cambivora* and *P. cinnamomi*) with particular reference to the investigations of Day in England [*R.A.M.*, 18, p. 825], Crandall and his co-workers in the United States [24, p. 295], and Grente and Solignat in France [32, p. 106]. In 1948 he visited the chestnut plantations on the slopes of Mt Portella, in the province of Catanzaro [Calabria], where he observed the disease in mild form. On a further visit, in 1952, he found that the number of affected trees had increased considerably, the areas concerned were more extensive, and the attacks were much more virulent. The exceptional severity of this outbreak may, it is thought, be attributable to a weakened condition of the trees induced by severe drought. Further work is in progress.

Tocchetto (A.). **Causas da podridão da Castanha japonesa e contrôle.** [Causes and control of decay of Japanese Chestnut.]—*Rev. Agron. Pôrto Alegre*, 17, pp. 113–121, 6 figs., 1954.

The Japanese chestnut (*Castanea japonica*), a valuable food crop in the State of Rio Grande do Sul, Brazil, is susceptible to infection by various fungal rots unless consumed immediately after harvesting. At this time 80 per cent. of the nuts are completely sound, but 20 days later only 20 per cent. are fit for consumption. In 1951, 84 per cent. of 64 isolations yielded *Dothiorella* sp., 11 per cent. *Phoma endogena* [*R.A.M.*, 30, p. 5], and 5 per cent. *Fusicoccum castaneum* [*Cryptodiaporthe castanea*: 16, p. 845], the corresponding figures for 1952 being 55, 34, and 11, respectively.

Control measures should include harvesting as soon as the burrs begin to split; refrigeration of lots intended for immediate consumption to prevent the rapid development of any fungi parasitic on the pericarp or the floral extremities adhering to the nuts; and drying of the remainder, in stoves or in sunlight, until the moisture content is reduced to 10 to 14 per cent., followed by fumigation with carbon disulphide (350 ml. per cu. m.) for 24 to 48 hours or methyl bromide (25 to 30 gm. per cu. m.) for 16 hours to exterminate insect larvae.

Müller-Kögler (E.). **Bekämpfung des Eichenmehltaus.** [Control of Oak mildew.]—*Forstsch. Merkbl. niedersächs. forstl. VersAnst.*, Abt. B, 5, 4 pp., 1954.

Information on the control of oak mildew (*Microsphaera alphitoides*) in Germany, with special reference to the north and north-west, is recapitulated and amplified. Besides liquid or wettable cosan, sufran, and TOP, wettable sulphurs are recommended, to be used preferably at the higher concentration of 0·4 per cent. The

trees should be observed continuously from mid-June onwards and the first treatment given shortly before or coinciding with the onset of a warm spell. In general, three applications at three- to four-weekly intervals should suffice for practical and economic control, but in cases of exceptionally early or severe outbreaks four are generally necessary, and where total elimination of the fungus is desired fortnightly treatments may be essential.

MALENÇON (G.) & MARION (J.). **Les modalités épidémiologiques de l'Hypoxylon méditerranéeum (D. Ntrs) Ces. & D. Ntrs en Afrique du nord.** [The epidemiological modality of *Hypoxylon mediterraneum* (de Not.) Ces. & de Not. in North Africa.]—Reprinted from Fasc. IV du 70e Congrès de l'A.F.A.S., Tunis, Mai 1951. [Part IV of the 70th Congress of the A.F.A.S., Tunis, May, 1951. Received February, 1955.]

This information concerning *Hypoxylon mediterraneum* on cork oak [*Quercus suber*] in Morocco, Algeria, and Tunisia has already been noticed from another source [*R.A.M.*, 32, p. 459].

CAROSELLI (N. E.). **Verticillium wilt of Maple.**—*Diss. Abstr.*, 14, 12, pp. 2186–2187, 1954.

Verticillium wilt of maple [*Acer* sp.] caused by *V. albo-atrum* [*R.A.M.*, 15, p. 693; 30, p. 142] was induced at Brown University [Providence 12, Rhode Island], by inoculating any part of the vascular system of the root or stem by either the agar-disk or spore-suspension method, but not by leaf inoculation. Spread, as evidenced by greenish discoloration of the sapwood and leaf wilting, was always upward. Wilt severity decreased in the field as the date of inoculation was delayed: none occurred following inoculations in late August. The fact that inoculation at several points on the trunk resulted in more sapwood discoloration but only slightly more wilt than in trees receiving one inoculation only appears to disprove the theory that wilt results from plugging of the vessels. Incidence in inoculated field-grown trees was increased by increasing the concentration of the spore suspensions, adding a toxin to the suspension, and injuring the root system. Trees defoliated prior to inoculation developed no disease. A potato-isolation technique demonstrated that the fungus remained viable in the soil for at least two years. Disease incidence under controlled conditions varied inversely with an increase in soil-water. Wilt symptoms and sapwood discoloration varied inversely with the water content of the sapwood. Some degree of control was secured by treating the soil around diseased field-grown maples with nugreen, milorganite, cyanamide, and a 6–8–7 'tree food'; ammonium sulphate gave the best results.

In culture strain V-10 grew well with zinc and iron added to the medium. In a liquid medium it produced a toxic filtrate which inhibited liquid uptake by young tomato cuttings and induced wilt in tomato and maple cuttings and in potted maples. The filtrate contained at least two wilt-inducing components [34, p. 266]: a polysaccharide causing stem wilt and thiourea causing leaf wilt. The former was produced consistently by all strains. The latter, though produced by all strains except a non-matted, white variant, appeared in only 40 per cent. of the filtrates. Of various chemicals tested 17 were fungistatic and hydroquinone acted as an antidote to the toxic filtrate. Over 150 isolates from wilted maples grown on Czapek's medium fell into 10 distinguishable strains, V-1 to V-10. Some produced a matted, white variant reverting to the parent type and others a non-matted white variant which remained stable. All the strains changed morphologically and culturally with changes in temperature and nutrition and were similar in their ability to cause disease and produce polysaccharide and thiourea. A soil actinomycete and *Bacillus subtilis* produced a metabolite antagonistic to strain V-10 [cf. 33, p. 105].

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